Senior 4 Applied Mathematics (40S)
Standards Test

Administration Manual for Supervising Teachers

June 2003

Manitoba
Education
and Youth

Copyright © 2003, the Crown in Right of Manitoba
as represented by the Minister of Education and Youth.
Manitoba Education and Youth,
Assessment and Evaluation Branch,
Winnipeg, Manitoba R3E 3J5.

Permission is hereby granted by the copyright owner to reproduce
this document on a non-profit basis for educational purposes
provided the source is mentioned.

Preface

This *Administration Manual for Supervising Teachers* is distributed to teachers and administrators, and must be read prior to administering the standards test. The rules and guidelines in this manual must be strictly observed to ensure the consistency of standards test administration.

Please use this manual in conjunction with the registration package, the *Policies and Procedures for Standards Tests* handbook and the *Information Bulletin* to gain a full understanding of the protocols and procedures associated with this test. This manual contains general information about the test, step-by-step instructions for each day of the test administration, and policies regarding absenteeism, lateness, violation of rules, etc.

If you encounter exceptional circumstances not addressed in this manual, or if you have further inquiries, contact Brenda Brokenshire, Administrative Officer, at 945-5114, or toll-free at 1 800 282-8069, extension 5114.

TABLE OF CONTENTS

Page

General Information 1
- Features of the test 2
- Test schedule 3

Policies for Standards Tests 3
- Adaptations 3
- Exemptions 3
- Re-read provisions 4
- Return of tests to students 4
- Test confidentiality 4
- Student materials 4
- Students leaving the room 5
- Late arrivals 5
- Student absences 5
- Responding to student questions 5
- Violation of rules 6
- Damaged or misprinted material 6
  - On test administration date 6
  - During test administration 6

Responsibilities of School Principals 7

Responsibilities of Supervising Teachers 8
- Checklist of Procedures 9
  - Advance Preparations 9
  - Prior to the test session 9
  - Beginning the test session 10
  - During the test session 11
  - Ending the test session 12
- Submitting Test Materials 14
  - Centralized Marking (Inquiry Task and Written Test scored at a central location) 14
  - School-based and Classroom-based Marking (Inquiry Task and Written Test scored by classroom teacher) 15

Appendices 17
- Appendix 1: Inquiry Task Session Rules 19
- Appendix 2: Written Test Session Rules 20
- Appendix 3: Sample Generic Demographic Data Form 21
- Appendix 4: Sample Attendance Form 22
- Appendix 5: List of Reason Codes to Record Changes in Standards Test Student Registration Numbers 23

General Information

Manitoba Education and Youth develops all standards tests in collaboration with teachers from across the province. This standards test is based on the *Senior 4 Applied Mathematics: A Foundation for Implementation (2000).*

The standards test is locally marked and counts for 30% of each student's final grade in the course. Marking instructions are provided by the department immediately following test administration. School principals will receive Senior 4 Applied Mathematics (40S) Standards Test *Marking Guides* by June 12, 2003. The *Marking Guides* are to be stored in a secure location until 12:30 p.m. on June 12, 2003. Student results on the test will be released to students according to local policy on the date designated by local jurisdictions.

All students enrolled in Senior 4 Applied Mathematics (40S), except those who have been exempted, must write the Senior 4 Applied Mathematics (40S) Standards Test on June 11 and 12, 2003. However, a student may rewrite a mandatory provincial standards test at any regularly scheduled administration without being registered in the course (see *Policies and Procedures for Standards Tests*, Section 3.1).

Students are expected to write the standards test as scheduled near the end of the semester in which they take the course (i.e., January for first-semester courses, June for second-semester and full-year courses).

All schools should receive the test materials by June 2, 2003. Principals of public schools receive test materials from their division offices. Principals of independent and band-operated schools will receive test materials directly from the Assessment and Evaluation Branch.

The number of test booklets sent to each school is based on the February 21, 2003 registration information provided by the school. Please advise Brenda Brokenshire, Administrative Officer, at 945-5114, or toll-free at 1 800 282-8069, extension 5114, immediately if the number of students registered to write the test has increased since registration.

In the context of marking standards tests at the local level, Manitoba Education and Youth will:

- train representatives from local jurisdictions to act as Local Marking Co-ordinators.
- collect and scan all *Answer/Scoring Sheets* (for the Written Test) and *Recording Sheets* (for the Inquiry Task) from jurisdictions to provide them with test result summaries.
- centrally mark a random sample of locally-marked test booklets to provide feedback to jurisdictions on their local marking.
- support provincially-funded local jurisdictions by providing $10.00 for each locally-marked test administered in accordance with the test schedule noted on page 3.

Features of the test

- The test is comprised of two components: an Inquiry Task and a Written Test.
- English or French versions of the test will be available for students enrolled in Senior 4 Applied Mathematics (40S) and « Mathématiques appliquées de secondaire 4 (40S) ».
- The Inquiry Task component consists of items targeting two curriculum units of the *Senior 4 Applied Mathematics: A Foundation for Implementation (2000)*. This school year for both semesters, the two units assessed by the Inquiry Task are Personal Finance and Design and Measurement.
- The Written Test will assess the remaining six curriculum units and will not include items from the two units already assessed by the Inquiry Task.
- The Inquiry Task comprises 25% and the Written Test 75% of the total marks of the standards test.
- The Inquiry Task requires the use of technology such as computer software and/or a graphing calculator.
- The Written Test requires the use of a graphing calculator although students may use computer software depending on the tools normally used in the classroom for instruction. Internet access is not allowed.
- The main characteristic of the Inquiry Task is the investigative nature of the items that require some reflection on the part of the student for problem solving. The Inquiry Task will consist only of constructed-response items that may range from restricted-response, restricted-response with explanation to open-response items.
- The Written Test will consist of multiple-choice items as well as constructed-response items.
- Strict administrative procedures as detailed in this manual need to be followed by the classroom teacher to avoid any compromise to the integrity of the test.

Test schedule

The following table summarizes the schedule for the Senior 4 Applied Mathematics (40S) Standards Test:

Date	Session	Preparation Time	Activity	Time Required for Test
Wednesday, June 11, 2003	1	15 minutes preparation and instructions	Inquiry Task	2 hours
Thursday, June 12, 2003	2	15 minutes preparation and instructions	Written Test	2.5 hours

The test must be written between 8:30 a.m. and 12:30 p.m. on Wednesday, June 11, 2003 and Thursday, June 12, 2003.

The total writing time is 2 hours for the Inquiry Task and 2.5 hours for the Written Test plus 15 minutes for preparations and instructions before each test session.

Policies for Standards Tests

Principals and supervising teachers should be aware that *Policies and Procedures for Standards Tests* handbook has been distributed to all schools and is available at http://www.edu.gov.mb.ca/ks4/assess/publications.html. This handbook outlines current policies and procedures related to the administration of standards tests and reflects the principles and guidelines contained in *Principles for Fair Student Assessment Practices for Education in Canada (1993).*

Adaptations

Schools are asked to identify and submit requests for test adaptations **at the time of student registration**. These requests should be submitted on the *Request for Adaptations Form* included with the registration package. Following departmental review of the adaptation requests received, schools will be advised of the department's decision regarding these requests. (See *Policies and Procedures for Standards Tests,* Sections 4.0, 4.1 and 4.2.)

Exemptions

Decisions for student exemptions that fall within the guidelines set out in *Policies and Procedures for Standards Tests* (Sections 5.0, 5.1 and 5.2) are made at the school level and do not require departmental approval. Schools are required, however, to report school-based exemptions on the *Student Exemption Report* included with the registration package. If additional student exemptions are needed after the registration deadline date, an additional *Student Exemption Report* should be submitted as soon as possible.

For exemptions that fall outside the parameters of policy and procedure guidelines, requests should be made **at the time of student registration**. Please submit requests in writing to Ernest Molgat, Director, Assessment and Evaluation Branch, 71–1567 Dublin Avenue, Winnipeg MB R3E 3J5.

Re-read provisions

As the reporting of individual student scores on locally-marked standards tests is the responsibility of each local jurisdiction, the re-read policy for these tests is determined locally. Should a re-read be required for a test booklet that has been sent to the department as a part of the feedback marking process, the department will return a photocopy of the test booklet upon request. Please contact Brenda Brokenshire, Administrative Officer, at 945-5114, or toll-free at 1 800 282-8069, extension 5114.

Return of tests to students

Local jurisdictions decide whether to keep the test booklets or return them to students. The department will return the random sample of test booklets to schools within three months of marking.

Test confidentiality

Test materials must be kept secure and sealed until administration.

After each session, all materials are returned for safe-keeping to the secure area.

Test booklets must not be reproduced nor information from them communicated in any way until test administration is completed.

The *Marking Guides* are to be stored in a secure location until the test administration is complete.

Student materials

Students may use the following materials during the Senior 4 Applied Mathematics (40S) Standards Test:

- HB lead pencil;
- eraser;
- ruler;
- protractor;
- extra piece of 8 ½ × 11 blank paper and/or 0.5 cm graphing paper provided by the classroom teacher during the test sessions upon request;
- graphing calculator; and
- computer software for either or both the Written Test and Inquiry Task.

Students are not permitted to exchange materials or use the Internet during the test.

Please note that students may choose to print their responses from the computer. In such cases, students are to indicate their booklet ID number on each page and remain seated at all times. You are responsible for distributing the printouts to them according to booklet ID number, so they can staple them appropriately to their booklets. Internet access is not allowed.

The following materials must **not** be used during the test:

- personal notes;
- textbooks; or
- dictionaries.

Students leaving the room

Students are expected to remain in the room for a minimum of 60 minutes from the start of each test session.

However, any student who must leave and re-enter the room should be accompanied by a replacement supervisor. This practice ensures that the supervising teacher can remain in the test room with the students at all times.

Late arrivals

Students who arrive more than one hour after the test has started will not be allowed to write the test. Students who arrive late but within the first hour of the test will be allowed to write. In this case, the student will be allowed additional time corresponding to the amount of time by which the student was late.

Student absences

Standards tests cannot be written at a later date and reported as a standards test result. Therefore, schools have the responsibility to provide a final mark to absent students. The final mark for these students must be identified as the result of a school-based assessment and evaluation practice only. (See *Policies and Procedures for Standards Tests,* Sections 6.0, 6.1 and 6.2, for additional information.)

Responding to student questions

Avoid making any directing/guiding comments during the test, other than those required for distribution of materials and instructions to students.

No explanations, translations, rephrasing, clarifying statements or comments of a similar nature may be provided about the test content. Supervising teachers can, however, provide clarification regarding test-taking rules or procedures.

If a student asks a question related to test content, a suggested response is, "I'm sorry. I can't answer your question. Do your best with it."

Suspected errors in printing or wording should not be communicated to students unless specific instructions are received from the Assessment and Evaluation Branch. You may however, contact Ken Clark, Assessment Consultant, at 945-3666 or Philippe Le Dorze, Assessment Consultant, at 945-0670 or toll-free at 1 800 282-8069, extensions 3666 or 0670 respectively to report any suspected errors.

Violation of rules

The *Inquiry Task Session Rules* or the *Written Test Session Rules* are read aloud to students by the supervising teacher immediately before each session of the test. (See Appendices 1 and 2, p. 19 and 20.)

Document any violation of rules on the *Supervising Teacher Report*. This documentation should include:

- the test booklet number;
- a description of the circumstances, including available evidence.

The student may be permitted to complete the test.

The consequences of any violation of rules are a local decision.

Damaged or misprinted material

Students should be assured that they will not be penalized for any obvious error in printing or wording. Local marking co-ordinators will be advised of any known errors before the marking session. Return the unused damaged or misprinted booklet(s) with the reports and forms being sent to the department immediately after the final test session.

On test administration date

If a damaged or misprinted test booklet is discovered **at the start** of the test session:

- replace the damaged or misprinted test booklet with a new test booklet; and
- print "DAMAGED" on the test booklet cover and on the *Attendance Form*.

During test administration

If a damaged or misprinted test booklet is discovered **during** the writing of the test:

- give the student a new test booklet (the student keeps the damaged test booklet until the end of the session);
- instruct the student to continue responding to test items in the new test booklet;

- collect both test booklets at the end of the test session;
- cross out the existing booklet number on the undamaged test booklet and change it to the original booklet number so that **all student responses are recorded under the original booklet number**;
- indicate on the *Attendance Form* that two booklets have been used for one student (see Appendix 4, p. 22);
- record the damaged or misprinted test booklet number on the *Supervising Teacher Report*; and
- ensure both booklets are kept together by bundling with an elastic band.

Responsibilities of School Principals

It is the responsibility of the principals to ensure that the tests are kept confidential until test administration is completed.

Other responsibilities are listed below.

If tests are not in your school by June 2, 2003:

- public school principals should contact their superintendent;
- principals of independent and band-operated schools should contact Brenda Brokenshire, Administrative Officer, at 945-5114, or toll-free at 1 800 282-8069, extension 5114.

Use the *Packing List* to confirm that all materials have been received. Count the shrink-wrapped test booklets to ensure that there are enough booklets for the number of students writing the test. Keep the shrink-wrapped test packages unopened until the morning of the test. If additional test materials are needed, immediately contact Brenda Brokenshire, Administrative Officer at the number noted above.

Please note that the shrink-wrapped test bundles are divided into two packages. The Inquiry Task package should be opened on June 11, 2003 in preparation for the beginning of the Inquiry Task session.

The Written Test package should remain unopened in a secure location until the morning of June 12, 2003, at which time the Written Test will be administered.

Store test materials in a secure area in the school.

Provide supervising teachers with a listing of the Manitoba Education and Youth (MET) numbers for the students registered to write the test. Call the Professional Certification and Student Records Unit at 1 800 667-2378 to obtain MET numbers for new students.

Make arrangements to meet the requirements of the adaptations approved for your students. (See Adaptations, p. 3 and *Policies and Procedures for Standards Tests*, Sections 4.0, 4.1 and 4.2.)

Co-ordinate test scheduling and space requirements.

Minimize the frequency of school announcements during the test sessions.

Ensure that a replacement supervisor is available to accompany students who must temporarily leave the room.

Provide the test materials to the supervising teacher on each morning of the test.

Advise the Assessment and Evaluation Branch of school closures or suspended school bus transportation services that occur on the test dates as a result of unusual or extenuating circumstances or inclement weather conditions. Please contact Ken Clark, Assessment Consultant, at 945-3666 or Philippe Le Dorze, Assessment Consultant, at 945-0670 or toll-free at 1 800 282-8069, extensions 3666 or 0670 respectively.

Complete the *Principal Feedback Form* before the end of the final test session.

Responsibilities of Supervising Teachers

Supervising teachers administer the test using the step-by-step procedures outlined in the following section ("Checklist of Procedures") in this manual.

Points to Remember

- Remain in the classroom throughout the entire test session and engage in work solely related to the duties of supervising the test.
- A replacement supervisor must be available to assist you.
- Store all documents not in use in a secure area in the school.
- Ensure that once a booklet number has been assigned to a student, all materials distributed to that student have the same booklet number.
- Students may **not** have access to their test booklets between sessions.
- Students may **not** bring anything produced outside of class into the test sessions.
- Students may not review or complete work from any previous session.
- Students may **not** use the Internet during the test.

In the "Checklist of Procedures", shaded areas indicate the step is not applicable for that session.

Checklist of Procedures

Session 1	Session 2	
		Advance Preparations
		1. Check with your principal to ensure that:
		• appropriate scheduling and space allocation for the test has occurred.
		• the test materials itemized on the *Packing List* have been inventoried.
		• a replacement supervisor is available to accompany students who must temporarily leave the room during the test.
		• arrangements have been made to accommodate the adaptations approved for students.
		• a list of MET numbers for students writing the test is available.
		2. Ensure that all subject-related materials have been removed from the walls and boards.
		3. Notify students in advance of the:
		• time, location and duration of each test session;
		• materials needed to write the test;
		• *Inquiry Task Session Rules* and the *Written Test Session Rules* (see Appendices 1 and 2, pp. 19 and 20); and
		• requirement to remain in the test session for at least 60 minutes.
		4. Ensure that you have extra supplies and that there is a functioning pencil sharpener and stapler in the room. Students must not exchange materials during the test. If students print their responses from the computer, they should remain seated. Distribute the printouts to them according to booklet ID numbers identified on each page of the printout.
		5. If there is more than one teacher supervising the test, photocopy the *Supervising Teacher Report*.
		6. Review the sample forms in the Appendices.
		Prior to the test session
		1. Ensure that your materials are available:
		• *Packing List*;
	▨	• *Senior 4 Applied Mathematics (40S) Standards Test—Inquiry Task* booklets;
▨		• *Senior 4 Applied Mathematics (40S) Standards Test—Written Test* booklets;
		• *Attendance Forms* (enclosed with shrink-wrapped test booklets);
		• *Student Registration Update Form*;
	▨	• four extra copies of Inquiry Task booklets;
▨		• four extra copies of Written Test booklets;
		• *Demographic Data Forms*;

Session 1	Session 2	
■		• *Answer/Scoring Sheets* (for the Written Test);
	■	• *Recording Sheets* (for recording marks for the Inquiry Task) (Keep in a secure location and forward to marking site (if applicable) with test materials on June 12, 2003);
		• *Supervising Teacher Report*;
		• *Supervising Teacher Feedback Form*;
		• *Principal Feedback Form* (this must be given to the principal and collected before returning materials);
		• *Administration Manual for Supervising Teachers* (this document); and
		• Xpresspost Flexipack envelope (for schools outside the city of Winnipeg) for return of materials to the Assessment and Evaluation Branch.
		• labelled envelope (for schools within the city of Winnipeg) for return of materials to the Assessment and Evaluation Branch.
		2. Before opening the shrink-wrapped packages, ensure that you have the appropriate test booklets for the program being taught (e.g., French Immersion).
		3. Count the number of *Senior 4 Applied Mathematics (40S) Standards Test—Inquiry Task* booklets (Day 1) and *Written Test* booklets (Day 2). The number of test booklets should equal the number requested by the school plus the additional booklets. The number of booklets should also be identical to the number on the *Packing List*. If you need to split a bundle of booklets between classrooms, make a photocopy of the *Attendance Form* enclosed with the bundle. **On your copy**, cross out the test booklet numbers that are not used in your classroom and forward these booklets to the supervising teacher who requires them.
		4. Arrange the desks so they are spaced as far apart as possible.
		5. Ensure that students exempted from writing the test are not present.
		Beginning the test session
		1. Distribute:
	■	• *Senior 4 Applied Mathematics (40S) Standards Test—Inquiry Task* booklet
■		• *Senior 4 Applied Mathematics (40S) Standards Test—Written Test* booklet
■		• *Answer/Scoring Sheets*
		• *Demographic Data Forms* (as needed in Session 2)
■		2. Remind students to check that the number on the *Answer/Scoring Sheet* corresponds to the number on their *Senior 4 Applied Mathematics (40S) Standards Test—Written Test* booklet.
		3. Tell students that while they are working you will:
	■	• be circulating the *Attendance Form* so they can print their names beside their test booklet number;

Session 1	Session 2	
		• tell them and write on the board the time and location of the Written Test.
		4. Ensure that each student receives the correct test booklet by verifying that the test booklet number corresponds to the student name recorded on the *Attendance Form*.
		5. Read instructions for completing *Demographic Data Forms* printed on the top left corner. Direct students to print and shade in all the information requested on the *Demographic Data Form*. Remind students of the importance of accurately recording the program (English, French Immersion or Français) they are now in.
		6. Collect the *Demographic Data Forms* (as needed in Session 2).
		7. Read aloud *Inquiry Task Session Rules* (Appendix 1, p. 19) to students.
		8. Read aloud *Written Test Session Rules* (Appendix 2, p. 20) to students.
		9. Read aloud "Description" and "Test Resources and Directions" from Inquiry Task booklet to students (page 3 in test booklet).
		10. Read aloud "Description" and "Test Resources and Directions" from Written Test booklet to students (inside cover in test booklet as well as the directions on page 9).
		11. Remind students to:
		• pace themselves in writing the test;
		• use the *Answer/Scoring Sheet* for responding to multiple-choice questions; and
		• check over their work to ensure that all questions have been attempted.
		12. **Instruct students to turn the page and begin. Record the start time on the *Supervising Teacher Report*.**
		During the test session
		1. Supervise the completion of the *Attendance Form* by ensuring that students print their name beside their test booklet number. Under "Student Attendance During Test Sessions", record a "✓" for present. The names of absent students should be written on the *Attendance Form* so that these students will have a booklet number for the Written Test session of the test. Indicate that the student is absent by recording an "A" on the *Attendance Form* (see *Sample Attendance Form*, Appendix 4, p. 22). **Note:** This is the only record connecting students' identities to their Senior 4 Applied Mathematics (40S) Standards Test booklet.
		2. Ensure that each student absent for the first test session completes a *Demographic Data Form*.
		3. Verify that all the information on each *Demographic Data Form* is accurately printed and shaded. If the information on the form is inaccurate, erase the error and record the correct information. Place all used forms in numerical order (by booklet number) followed by any unused forms in the labelled envelope provided. Do not use elastic bands, staples or paper clips on these forms as they may damage the sheets. Do not seal the envelope.

Session 1	Session 2	
		4. Half-way through the test session, advise students of the amount of time remaining by making an announcement and writing the remaining time on a board.
		Ending the test session
		1. Collect the test booklets from each student. Extra paper printed out or used by a student must be stapled in the booklet at the appropriate page.
		2. Have students place their *Answer/Scoring Sheet* inside the front cover of the test booklet. Extra paper printed out or used by a student must be stapled in the booklet at the appropriate page (or onto the back page if used for miscellaneous calculations). Collect the test booklets from each student.
		3. As students submit their test materials, ensure that each test booklet number matches the information on the *Attendance Form*, the *Demographic Data Form* and the *Answer/Scoring Sheet* (as applicable) (e.g., cross-reference student name and test booklet number). Each student must have the same booklet number on all test materials.
		4. Place a check "✔" on the *Attendance Form* in the "Booklet Submitted to LMC* for Marking" column.
		5. **Record the time students finish writing the test on the *Supervising Teacher Report*.** Do not include extra time given for late arrivals or adaptations.
		6. Stack the test booklets in numerical order.
		7. If marking is to be conducted at a central location, place all used *Answer/Scoring Sheets* in numerical order followed by any unused forms. Place these forms in the labelled envelope provided. Do not seal the envelope.
		8. Complete the *Supervising Teacher Report*. Note any unusual circumstances on this report.
		9. Ensure that the number of check marks in the "Booklet Submitted to LMC* for Marking" column on the *Attendance Forms* matches your count of the booklets and *Answer/Scoring Sheets* (as applicable) for submission.
		10. Complete and check the *Student Registration Update* form. Use the reason codes (Appendix 5, p. 23) provided.
		11. Make one or two copies of the *Attendance Forms* and *Supervising Teacher Report*. One copy must be retained by the school and one forwarded to the local marking site, if a centralized model is used.
		12. Collect the *Principal Feedback Form*.
		13. Complete the *Supervising Teacher Feedback Form*.
		14. Return all test booklets and other test-related materials to the **secure area** in the school until the next session, the commencement of marking or until materials are to be forwarded to the local marking site.
		15. Send materials according to the instructions on the following pages.

* Local Marking Co-ordinator

Submitting Test Materials

Schools may use a variety of marking models for the Senior 4 Applied Mathematics (40S) Standards Test. The shipping directions for test materials are specific to the marking model used.

Centralized Marking (Inquiry Task and Written Test scored at a central location)

Before marking

It is essential that the following materials are packaged and forwarded **to the local marking site** immediately after completion of the Written Test on June 12, 2003:

- **all used** test booklets (for the Inquiry Task and the Written Test);
- **all used** *Answer/Scoring Sheets*;
- all *Recording Sheets*;
- copy of the *Attendance Forms*; and
- copy of the *Supervising Teacher Report*.

All other documentation should be verified and returned **to the Assessment and Evaluation Branch** by the supervising teacher after completion of the Written Test on June 12, 2003.

- **all original** *Attendance Forms*;
- **all used** *Demographic Data Forms* (in envelope provided);
- *Student Registration Update Form*;
- *Supervising Teacher Report*;
- *Supervising Teacher Feedback Form*;
- *Principal Feedback Form*; and
- all damaged or misprinted booklets.

Schools in the City of Winnipeg return their envelopes to the Assessment and Evaluation Branch in the following way. Mid-Canada Courier is scheduled to pick up envelopes between **1:00 p.m. and 4:00 p.m.** on **June 12, 2003**. Call Mid-Canada Courier at 989-5630 when your envelope is ready. (See section "Shipping materials to the department", p. 14).

Schools outside the City of Winnipeg return their envelopes to the Assessment and Evaluation Branch by using the Xpresspost Flexipack envelope provided and taking it to the post office.

After marking

When local marking is done at a central location, the Local Marking Co-ordinator is responsible for sending the materials to Assessment and Evaluation.

After local marking is completed for both components of the standards test, prepare a package for return to Assessment and Evaluation no later than June 20, 2003.

The package must include:

- **all** *Answer/Scoring Sheets* and *Recording Sheets*;
- test booklets (two per student: an Inquiry Task and a Written Test) requested by the department for the feedback marking;
- *Sample Request List*; and
- *Local Marking Co-ordinator Feedback Form.*

School-based and Classroom-based Marking (Inquiry Task and Written Test scored by classroom teacher)

When local marking is done at the school or classroom level, the teacher is responsible for sending the materials to the Assessment and Evaluation Branch.

After local marking is completed for both components of the standards test, prepare a package for return to the Assessment and Evaluation Branch no later than June 20, 2003.

The package must include:

- **all original** *Attendance Forms*;
- **all used** *Demographic Data Forms*;
- *Student Registration Update Form*;
- *Supervising Teacher Report*;
- *Supervising Teacher Feedback Form*;
- *Principal Feedback Form*;
- **all** *Answer/Scoring Sheets* and *Recording Sheets*;
- test booklets (two per student: an Inquiry Task and a Written Test) requested by the department for the feedback marking;
- *Sample Request List*;
- *Local Marking Co-ordinator Feedback Form*; and
- all damaged or misprinted booklets.

Shipping materials to the department

Jurisdictions within the City of Winnipeg send packages directly to the Assessment and Evaluation Branch via Mid-Canada Courier (989-5630). The person placing the call should quote **account number E901,** give the jurisdiction name, address, and the name of the contact person.

Jurisdictions outside the City of Winnipeg return their package by Xpresspost. It is very important to package all materials in **one Xpresspost Flexipack envelope** whenever possible.

After the package is sealed, deliver it to the local post office.

We have provided sufficient materials for the return of **one** envelope/package. If you must send a second envelope/package, photocopy the mailing address label and affix the copy to the second package. Note you must use a photocopy of the mailing address label as it provides Canada Post with billing information. Ask the postal clerk for an additional bar code label to attach to the second envelope/package. Ensure that the school representative retains the bar code number in case tracing the package is required.

Return **all** local marking scan sheets. Payments will be made according to the number of tests marked, based on the local marking scan sheets received.

Appendices

Appendix 1: Inquiry Task Session Rules

Senior 4 Applied Mathematics (40S) Standards Test

The supervising teacher is expected to read these rules aloud to students at the beginning of the Inquiry Task session of the Senior 4 Applied Mathematics (40S) Standards Test:

- Check the title of your test booklet carefully. Make sure that it is entitled *Senior 4 Applied Mathematics (40S) Standard Test—Inquiry Task*. Verify that the test booklet number matches the number you have recorded on your *Demographic Data Form*.
- During this test session, do not proceed until instructed to do so.
- If you receive a damaged or misprinted booklet, ask for another booklet.
- You will not be permitted to leave the test room until **one hour** of test time has elapsed. (You may leave before that time in exceptional circumstances such as illness, when accompanied by a supervisor.)
- At the beginning of the session you should have only the test booklet for the Inquiry Task, *Demographic Data Form*, an HB pencil, eraser, ruler, protractor, and your graphing calculator or computer. If you need extra paper to show your work, please raise your hand and I will bring it to you. To write the test, you may use only the materials previously listed. **No** other materials are permitted. Do not exchange test materials.
- If you choose to print your answers from the computer, ensure your booklet ID number appears on each page. Remain seated and I will distribute the printouts to you. Internet access is not permitted.
- You will not give assistance to, nor receive assistance from, another student. If you require something during the test, raise your hand and I will come to you.
- Do not ask questions or request explanations with regard to the content of the questions on the test.
- Do **not** identify yourself or your school, teacher or town in your test booklet.
- When I ask you to stop writing, put your pencil down immediately.
- You may not discard any materials. The test booklet must remain intact except for the perforated *Formula Sheet*. Any extra paper used must be stapled into the test booklet on the appropriate page. You may **not** leave the room with any materials pertaining to the test.

Appendix 2: Written Test Session Rules

Senior 4 Applied Mathematics (40S) Standards Test

The supervising teacher is expected to read these rules aloud to students at the beginning of the Written Test session of the Senior 4 Applied Mathematics (40S) Standards Test:

- Check the title of your test booklet carefully. Make sure that it is entitled *Senior 4 Applied Mathematics (40S) Standard Test—Written Test*. Verify that the test booklet number matches the number on your *Answer/Scoring Sheet*.

- During this test session, do not proceed until instructed to do so.

- If you receive a damaged or misprinted booklet, ask for another booklet.

- You will not be permitted to leave the test room until **one hour** of test time has elapsed. (You may leave before that time in exceptional circumstances such as illness, when accompanied by a supervisor.)

- At the beginning of the session you should have only the test booklet for the Written Test, the *Answer/Scoring Sheet*, an HB pencil, eraser, ruler, protractor, and your graphing calculator or computer. If you need extra paper to show your work, please raise your hand and I will bring it to you. To write the test, you may use only the materials previously listed. **No** other materials are permitted. Do not exchange test materials.

- If you choose to print your answers from the computer, ensure your booklet ID number appears on each page. Remain seated and I will distribute the printouts to you. Internet access is not permitted.

- Rough calculations may be done in your booklet on the pages which state: "No marks will be awarded for work done on this page." These pages are located at the back of the test booklet.

- You will not give assistance to, nor receive assistance from, another student. If you require something during the test, raise your hand and I will come to you.

- Do not ask questions or request explanations with regard to the content of the questions on the test.

- Do **not** identify yourself or your school, teacher or town in your test booklet.

- When I ask you to stop writing, put your pencil down immediately.

- You may not discard any materials. The test booklet must remain intact except for the perforated *Formula Sheet*. Any extra paper used must be stapled into the test booklet on the appropriate page. You may **not** leave the room with any materials pertaining to the test.

Appendix 3: Sample Generic Demographic Data Form

DEMOGRAPHIC DATA FORM

Manitoba Education, Training and Youth

INSTRUCTIONS

- Use an HB pencil only.
- Do not use ink, ballpoint, or felt tip pens.
- Shade the circle completely.
- Erase cleanly any marks you wish to change.
- Do not mark other areas on this form.

EXAMPLES

INCORRECT	CORRECT
Ⓐ ✓ Ⓒ Ⓓ ✗ Ⓑ Ⓒ Ⓓ Ⓐ Ⓑ ◓ Ⓓ Ⓐ Ⓑ Ⓒ Ⓘ	Ⓐ Ⓑ Ⓒ ●

PROGRAM INFORMATION

- Ⓔ English Program
- Ⓘ French Immersion Program
- Ⓕ Français Program

NAME (Last)

NAME (First)

PROVINCIAL STUDENT (MET) NO.

BIRTH DATE

MONTH	DAY	YEAR
Jan		
Feb		
Mar	0 0	0 0 0 0
Apr	1 1	1 1 1 1
May	2 2	2 2 2 2
June	3 3	3 3 3 3
July	4 4	4 4 4 4
Aug	5 5	5 5 5 5
Sept	6 6	6 6 6 6
Oct	7 7	7 7 7 7
Nov	8 8	8 8 8 8
Dec	9 9	9 9 9 9

BOOKLET NO.

SCHOOL CODE

Appendix 4: Sample Attendance Form

Page _____ of _____

ATTENDANCE FORM—June 2003

Senior 4 Applied Mathematics (40S) Standards Test

Booklet Number	Student Name (*Please Print*)	Student Attendance During Test Sessions		Inquiry Task Booklet Submitted to LMC* for Marking (*check* ✓)	Written Test Booklet Submitted to LMC* for Marking (*check* ✓)
		Inquiry Task	Written Test		
10001	Sandra Jones	✓	✓	✓	✓
10002	Kevin Melnychuk	✓	A	✓	
10003	DAMAGED				
10004	Dallas Severn (also 10008)	✓	✓	✓	✓
10005	David Cameron	A	✓		✓
10006	Robert Smith	A	A		
10007	UNUSED				
~~10008~~	Used with 10004 (damaged)				
~~10009~~	Used in another classroom				
~~10010~~	Used in another classroom				

NOTE: Record a "✓" for Present. An "A" indicates a student is Absent.

Karen Booth

Supervising Teacher's Name (*please print*)

Please ensure that copies of these forms are retained for your records. You will need this form to link your locally marked test with a student's name.

*** Local Marking Co-ordinator**

Appendix 5: List of Reason Codes to Record Changes in Standards Test Student Registration Numbers

(Please use these codes to complete the *Student Registration Update* when returning to the Assessment and Evaluation Branch in JUNE 2003.)

Absent	
01	arrived too late to write the test
02	did not write due to weather
03	family/personal reasons
04	medical/illness/accident
05	out-of-town activity (athletic/academic)
06	religious objections
07	student refused to write
08	unexcused
09	working
19	other (please specify)

Withdrawn	
22	dropped course
23	incarcerated/court
24	medical/illness/accident
25	family/personal reasons
26	poor attendance/progress
27	quit school
29	other (please specify)

Incomplete	
40	continuing course/program next semester
41	no work completed
49	other (please specify)

Errors in Registration	
20	changed program
21	deceased
50	already has credit
51	auditing the course
52	exchange student
53	registered twice
54	quarter system projected registration
55	registered in wrong grade
59	other (please specify)

Exemptions	
60	emotional/psychological condition or circumstances
61	"M" credit designation
62	"E" credit designation
63	"phase d'accueil—bloc intensif" designation
69	other (please specify)

Drop Ins	
70	forgotten on original test registration
71	late registration to course
72	transferred in from another school/province/country
73	re-write (not currently enrolled)
79	other (please specify)

Migrancy	
90	transferred to another school within the province
91	transferred to another school outside of the province
99	other (please specify)

Senior 4 Applied Mathematics (40S)
Standards Test

Written Test

June 2003

Manitoba
Education
and Youth

SENIOR 4 APPLIED MATHEMATICS (40S)
STANDARDS TEST

DESCRIPTION

Total Possible Marks: 60 **Time: 2.5 hours**

This test consists of two sections:

	Description	Suggested Time to Complete	Marks
Section A	9 multiple-choice questions worth 1 mark each	20 minutes	9
Section B	14 constructed-response questions worth between 2 and 6 marks each	130 minutes	51

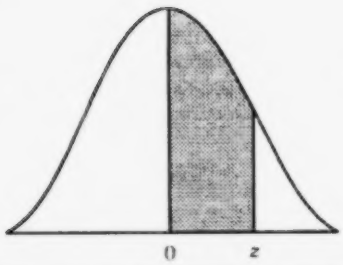
Test Resources and Directions

- Students are provided with the Standard Normal Distribution table and a formula sheet on a detachable sheet on pages 1 and 2 of this booklet.
- Use of a graphing calculator or computer software is allowed.
- Use of protractor and ruler are required.
- Read all instructions on the test carefully.
- In Section A, choose the best response and mark it on the back of the *Demographic Data Form*. Do not fold the *Demographic Data Form* or the test booklet.
- **If you need more space to answer a question, extra pages may be provided by your teacher. Write your booklet ID number and question number on any extra page(s) used and staple it into the booklet where your answer begins. Indicate in the response space of the question that the answer is on a separate sheet.**

Copyright © 2003, the Crown in Right of Manitoba
as represented by the Minister of Education and Youth.
Manitoba Education and Youth,
Assessment and Evaluation Branch,
Winnipeg, Manitoba R3E 3J5.

Permission is hereby granted by the copyright owner to reproduce this document on a non-profit basis for educational purposes provided the source is mentioned.

z-Score Chart



Notes:

1. For values of z above 3.09, use 0.4999 for the area.
2. Use these common values that result from interpolation:

z-score	area
1.645	0.4500
2.575	0.4950

The Standard Normal (z) Distribution

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

Formula Sheet

Vectors

$$\frac{a}{\sin A}=\frac{b}{\sin B}=\frac{c}{\sin C}$$

$$\sin x=\frac{o}{h} \quad \cos x=\frac{a}{h} \quad \tan x=\frac{o}{a}$$

$$a^2+b^2=c^2$$

$$a^2=b^2+c^2-2bc\cos A$$

$$b^2=a^2+c^2-2ac\cos B$$

$$c^2=a^2+b^2-2ab\cos C$$

Personal Finance

$$I=PRT$$

$$A=P\left(1+\frac{r}{n}\right)^{nt}$$

$$A=P(1+i)^n$$

$$\text{mill rate}=\frac{\text{total taxes to be raised}}{\text{total assessed value}}\times 1000$$

Probability

$$P(A')=1-P(A)$$

$$P(\text{success})=\frac{\text{number of successes}}{\text{number of outcomes}}$$

$$P(A \text{ or } B)=P(A)+P(B)-P(A \text{ and } B)$$

$$P(A \text{ and } B)=P(A)\times P(B)$$

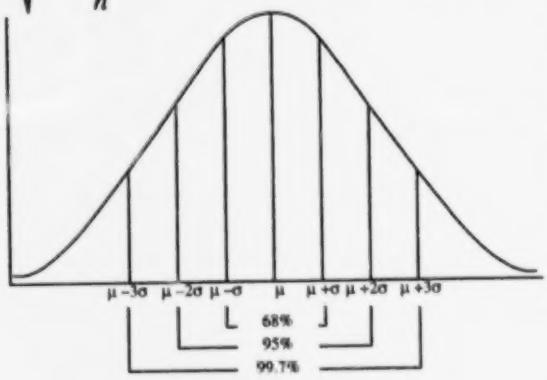
$${}_nP_r=\frac{n!}{(n-r)!}$$

$${}_nC_r=\frac{n!}{r!(n-r)!}$$

Variability and Statistics

$$z=\frac{x-\bar{x}}{\sigma} \qquad \bar{x}=\frac{\sum x}{n} \text{ or } \bar{x}=np$$

$$\sigma=\sqrt{\frac{\sum(x-\mu)^2}{n}} \qquad \sigma=\sqrt{npq} \qquad \mu=np$$



Design and Measurement

Rectangle: Area $=\ell \times w$

Circle: Area $=\pi r^2$ Circumference $=2\pi r$

Triangle: Area $=\frac{bh}{2}$

or $\sqrt{s(s-a)(s-b)(s-c)}$, where $s=\frac{a+b+c}{2}$

Trapezoid: Area $=\left(\frac{b_1+b_2}{2}\right)h$

Prism: Surface area $=Ph+2B$

Volume $=B\times h$

Pyramid: Volume $=\frac{B\times h}{3}$

Sphere: Volume $=\frac{4}{3}\pi r^3$ Surface area $=4\pi r^2$

Cylinder: Volume $=\pi r^2 h$ Surface area $=2\pi rh+2\pi r^2$

Periodic Functions

$$\text{Period}=\frac{2\pi}{\text{Frequency}} \text{ or } \frac{2\pi}{b}$$

$$y=a\sin(bx-c)+d$$

$$y=a\cos(bx-c)+d$$

SECTION A: MULTIPLE-CHOICE

Value: 9 marks **Suggested Time: 20 minutes**

1. If matrix $A = \begin{bmatrix} 1 & 0 & -1 \\ 2 & 1 & -2 \\ 3 & -1 & 2 \end{bmatrix}$ and matrix $B = A^3$, find the value of B_{31}:

   A) –3

   B) –6

   C) 9

   D) 10

2. When multiplying matrix A by matrix B, which of the following is true:

   A) number of rows of matrix A has to be the same as the number of columns of matrix B

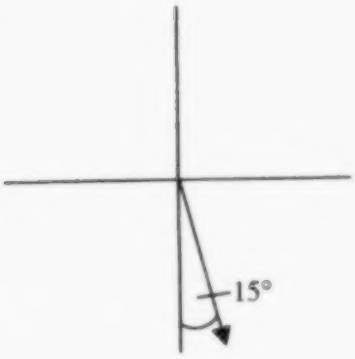
   B) number of columns of matrix A has to be the same as the number of columns of matrix B

   C) number of columns of matrix A has to be the same as the number of rows of matrix B

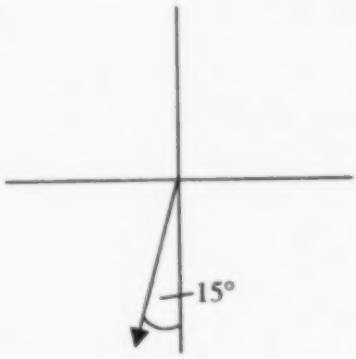
   D) number of rows of matrix A has to be the same as the number of rows of matrix B

3. Which vector can best be described as having a bearing of 195°?

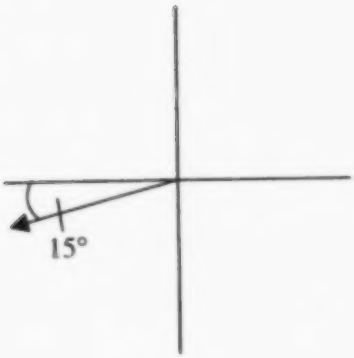
A)



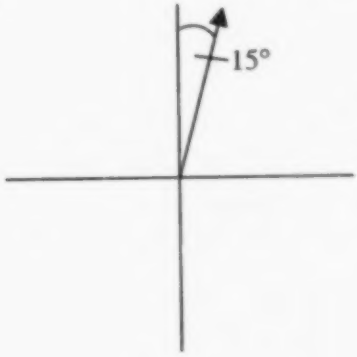
B)



C)



D)



4. How many ways can a committee of 4 students be selected from a class of 20 students?

A) 24

B) 4845

C) 29 070

D) 116 280

5. According to the Canadian Blood Service, the distribution of blood types is:

Type A = 42% Type O = 45% Type B = 9% Type AB = 4%

If we randomly tested two of your classmates, what is the probability that they both would have Type A blood?

A) 0.18

B) 0.21

C) 0.34

D) 0.84

6. A company gives its prospective employees a basic skills test. Generally, the company hires its staff from the top 8% of the applicants. Assuming the test scores are normally distributed, what would be the minimum z-score that an applicant could earn to be considered for employment?

A) -1.41

B) 0.84

C) 0.92

D) 1.41

7. The heart rates of a population are found to be normally distributed with a mean of 72 beats per minute and a standard deviation of 10 beats per minute.

What is the percentage of people with a heart rate between 60 and 80 beats per minute?

A) 7.82%

B) 9.68%

C) 67.31%

D) 78.81%

8. The population in Cambridge, Ontario in 2003 will be 75 231. If the population increases by 2.5% per year, predict the population for 2005.

A) 3762

B) 77 112

C) 78 993

D) 79 040

9. The following data represents the reduction of chlorine in a pool due to the destruction of algae. By what percent is the chlorine reduced each day?

Day	Chlorine in the pool
1	4.0000 ppm
2	3.6400 ppm
3	3.3124 ppm
4	3.0142 ppm

A) 9%

B) 25%

C) 36%

D) 91%

SECTION B: CONSTRUCTED-RESPONSE

(Value: 51 marks) **(Suggested Time: 130 minutes)**

DIRECTIONS

- There are 14 constructed-response questions in this section of the test. Each question is worth between 2 and 6 marks.
- Provide **complete answers** in the spaces provided in the test booklet. You may print out sketches from the computer or your calculator where applicable. Make sure these printouts contain your booklet ID number. Remain seated and your teacher will distribute these printouts to you. Staple the printouts in the booklet where the question begins. Indicate in the response space of the question that the answer is on a printed sheet.
- Provide clear explanations or justifications where applicable. This could be done through labelled diagrams, in words, by showing mathematical operations to verify your answer, or by referencing a software or a calculator program. If you reference a calculator program indicate your input values.
- Let the mark values for each question guide your time and the amount of detail you use in your answer. Mark values for subsections of a question are indicated in parentheses.
- Round your final answers to the nearest two decimal places.
- Unless otherwise specified, it is not necessary to draw sketches to scale. If you draw a scale diagram, make sure you indicate your scale.
- An answer without any work shown will be considered incomplete.

DO NOT USE

101

10. A small commercial fishing community has a work force of 1800 people. During the commercial fishing season 1580 people were employed full time, 125 were employed part time and the remainder were unemployed.

Total: 6 marks

Once the fishing season is over:

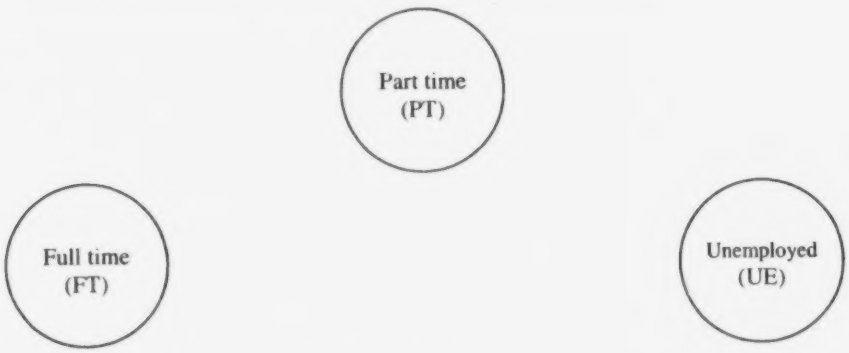
Of the full time employees:
- 45% will become unemployed
- 15% will begin working part time
- the remainder continue full time employment

Of the part time employees:
- 25% will become unemployed
- the remainder will continue part time employment

Of the unemployed:
- 10% will find full time employment
- 40% will find part time employment
- the remainder will continue to be unemployed.

a) Draw a transition diagram to represent these changes.

(1 mark)



b) Create a transition matrix representing this situation.

(2 marks)

$$T = \begin{array}{c} \\ FT \\ PT \\ UE \end{array} \begin{array}{c} \begin{array}{ccc} FT & PT & UE \end{array} \\ \begin{bmatrix} & & \\ & & \\ & & \end{bmatrix} \end{array}$$

c) Create a row matrix showing the initial distribution. Show a matrix operation to determine the distribution of workers during the next off-season.

DO NOT USE

(1 mark)

d) If this trend continues, what will be the number of full time, part time and unemployed workers once it stabilizes?

(1 mark)

e) Identify one factor that could affect the validity of your answer to part d).

(1 mark)

DO NOT USE

102

11. The following matrix represents the number of direct roads joining four different communities A, B, C, and D.

Total: 3 marks

$$R = \begin{array}{c} \\ A \\ B \\ C \\ D \end{array} \begin{array}{c} \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 \end{bmatrix} \end{array}$$

a) Create a matrix showing the number of ways of driving to any community directly or by going through at most one other community. Show the matrix operations you used to arrive at your answer.

(2 marks)

b) What can you conclude about community C?

(1 mark)

DO NOT USE

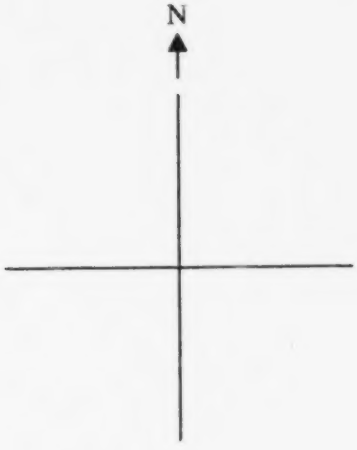
12. Heather drives 80 km north-east. She then turns east and drives for 180 km.

Total: 4 marks

a) Provide a well-labelled sketch of the situation and determine how far she is from her starting point. Show how you arrived at your answer.

103

(3 marks)



b) If she had driven directly to her destination at 80 km/hr, how long would it have taken her to reach her destination?

(1 mark)

DO NOT USE

104

13. An airplane flies from Winnipeg to Edmonton, a distance of 1300 km in a direction of W 25° N. Then, it flies from Edmonton to Vancouver, a distance of 1100 km in a direction of W 35° S.

Total: 6 marks

a) What is the shortest distance between Vancouver and Winnipeg? Provide a labelled sketch of the situation.

(3 marks)

b) The flight returns to Winnipeg from Vancouver with no stops. In order to avoid a storm near Vancouver, the airplane must begin its flight in a direction of S 40° E. Design and describe a flight completely including all distances and directions.

(3 marks)

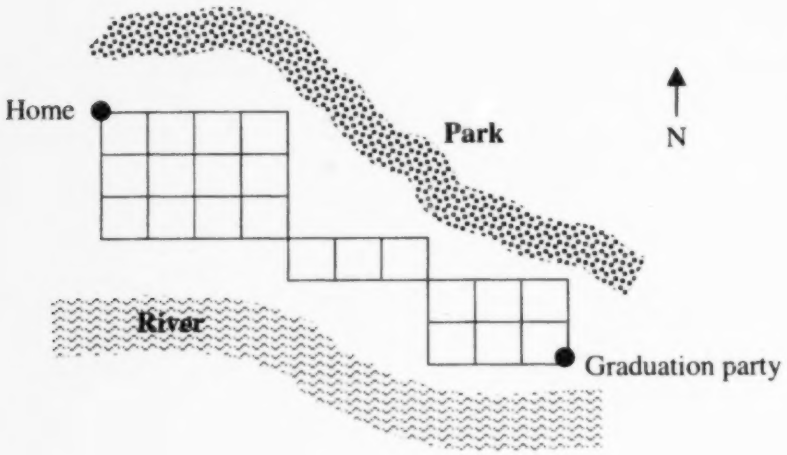
DO NOT USE

14. Ryan and Malika leave home and take a taxi to their Graduation party.

Total: 2 marks

Calculate how many different routes the taxi driver can follow to take them to their party. Assume he can only drive south or east. Show how you arrived at your answer.

105



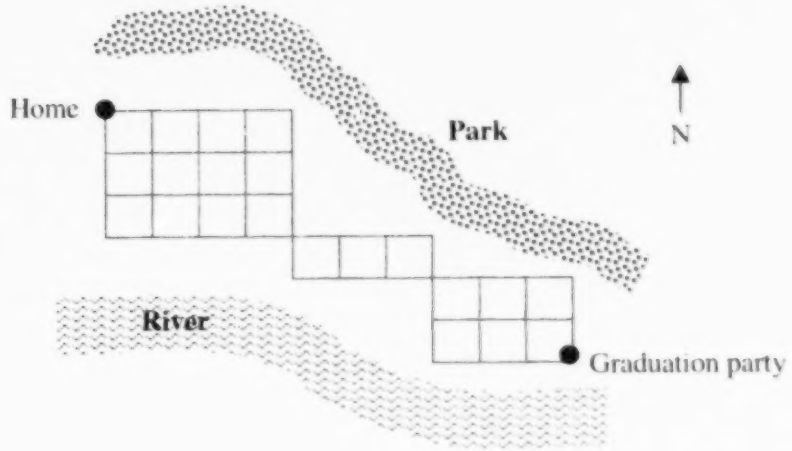
DO NOT USE

14. Ryan and Malika leave home and take a taxi to their Graduation party.

Total: 2 marks

Calculate how many different routes the taxi driver can follow to take them to their party. Assume he can only drive south or east. Show how you arrived at your answer.

105



DO NOT USE

106

15. We know that 60% of Manitoba's workforce lives in Winnipeg. The provincial unemployment rate is 6%.

Total: 2 marks

What is the probability that a randomly selected member of the workforce lives outside Winnipeg and is unemployed? Show how you arrived at your answer.

DO NOT USE

107

16. In a game of chance, there are two containers. You are blindfolded and you select one ball from each container.

Total: 3 marks

One container has 2 green balls and 8 red balls. The other container has 7 green balls and 3 red balls. To win a prize, you have to pick 1 red ball and 1 green ball.

a) What is the probability of you winning a prize?

(2 marks)

b) In a similar game, all the balls are in one container. Balls are replaced after each draw. Explain how this would change the calculation of the probability of winning a prize.

(1 mark)

DO NOT USE

108

17. Restaurant A sells french fries. A sample of 100 servings of fries is selected at random. The masses of these servings are measured and found to be normally distributed. The table below shows the data:

Total: 5 marks

Masses (in grams)	107.7	110.6	113.4	116.2	119.1
Frequency	1	15	66	16	2

a) Determine the mean and the population standard deviation of these data.

(2 marks)

b) Based on the mean and the population standard deviation of the sample above, predict the percentage of servings weighing more than 116.2 grams.

(2 marks)

c) Restaurant B sells fries for the same price. The masses of the servings of fries at this restaurant are also normally distributed with a mean and population standard deviation of:

(1 mark)

$$\bar{x} = 113.4 \text{ grams}$$
$$\sigma = 13.6 \text{ grams}$$

From which restaurant would you buy your fries? Support your answer statistically.

DO NOT USE

109

18. In a recent study, researchers found that 65% of all drivers speed regularly. A local insurance company decides to randomly check the speeds of 360 passing cars.

Total: 4 marks

a) Calculate the mean and standard deviation for the number of drivers who speed regularly.

(2 marks)

b) Find the 95% confidence interval for the number of cars the insurance company should expect to find speeding.

(1 mark)

c) Explain the meaning of this confidence interval.

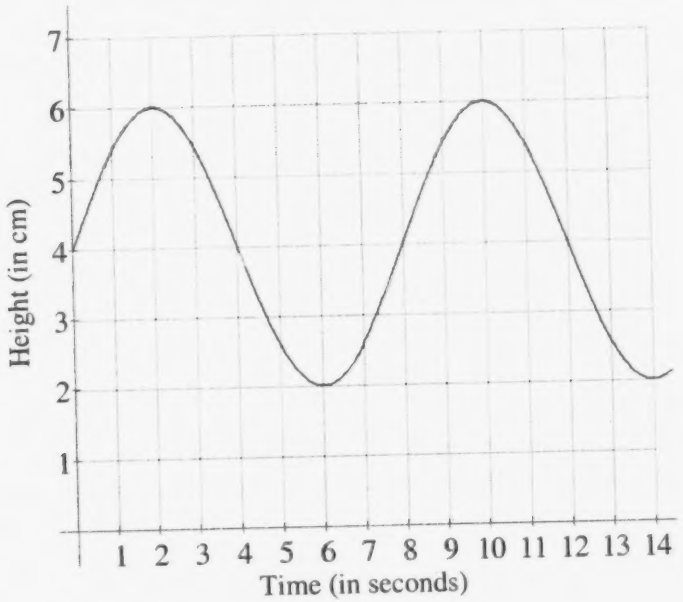
(1 mark)

DO NOT USE

110

19. A weight is suspended on a spring above a tabletop. The height (in cm) varies sinusoidally with time (in seconds). The data is presented in the following graph.

Total: 2 marks



What is the equation of the sinusoidal function?

DO NOT USE

111

20. The following data show how the depth of water at Qualicum Beach, BC, varies during one particular day due to the tides.

Total: 3 marks

Time (hrs)	1	3	5	9	11.5
Depth (metres)	2.3	4.7	5.3	1.3	0.6

a) Find an equation of the sinusoidal curve of best fit for this data.

(1 mark)

b) Graph your equation to determine the length of time the depth of water is below 1 m in the first 12 hours. Explain how you arrived at your answer.

(2 marks)

DO NOT USE

21. Two Ferris wheels are located at a carnival. The first rotates according to the model $y = 10\sin(0.105x - 1.571) + 11$ and the second rotates according to the model $y = 4\sin(0.262x - 1.571) + 5$ (where x is measured in seconds and y is measured in metres).

Total: 5 marks

112

a) What is the maximum height attained by the first Ferris wheel?

(1 mark)

b) How long does it take the second Ferris wheel to complete one full revolution? Show how you arrived at your answer.

(2 marks)

c) Each ride costs $3.00 and lasts approximately 5 minutes. Compare the two rides to determine which you would rather take. Use periodic data to support your choice.

(2 marks)

DO NOT USE

22. A study revealed that in January 2001, 5000 people in a town used the Internet. Each year, this number is influenced by the following:

Total: 3 marks

- the number of Internet users is increased by 25%
- 100 people cancel their Internet service.

Determine the number of people that will use the Internet in this town by January 2006. Show how you arrived at your answer.

113

DO NOT USE

114

Total: 3 marks

23. In an animated movie, Armand planted a tree. At the end of the first year, one branch grew and was 2 meters long. In the second year, two branches that were each 1 meter long grew from the first branch. In the third year, four 0.5-meter branches grew, two from each of the previous year's branches.

a) Continue the pattern to determine how many branches it will grow in the 4^{th} year. Show how you arrived at your answer.

(2 marks)

b) What will be the length of each branch from the 4^{th} year?

(1 mark)

END OF TEST

NO MARKS WILL BE AWARDED FOR WORK DONE ON THIS PAGE

NO MARKS WILL BE AWARDED FOR WORK DONE ON THIS PAGE

Senior 4 Applied Mathematics (40S)
Standards Test

Inquiry Task

June 2003

Manitoba
Education
and Youth

Copyright © 2003, the Crown in Right of Manitoba
as represented by the Minister of Education and Youth.
Manitoba Education and Youth,
Assessment and Evaluation Branch,
Winnipeg, Manitoba R3E 3J5.

Permission is hereby granted by the copyright owner to reproduce
this document on a non-profit basis for educational purposes
provided the source is mentioned.

Formula Sheet

Vectors

$$\frac{a}{\sin A}=\frac{b}{\sin B}=\frac{c}{\sin C}$$

$$\sin x=\frac{o}{h} \quad \cos x=\frac{a}{h} \quad \tan x=\frac{o}{a}$$

$$a^2+b^2=c^2$$

$$a^2=b^2+c^2-2bc\cos A$$

$$b^2=a^2+c^2-2ac\cos B$$

$$c^2=a^2+b^2-2ab\cos C$$

Personal Finance

$$I=PRT$$

$$A=P\left(1+\frac{r}{n}\right)^{nt}$$

$$A=P(1+i)^n$$

$$\text{mill rate}=\frac{\text{total taxes to be raised}}{\text{total assessed value}}\times 1000$$

Probability

$$P(A')=1-P(A)$$

$$P(\text{success})=\frac{\text{number of successes}}{\text{number of outcomes}}$$

$$P(A \text{ or } B)=P(A)+P(B)-P(A \text{ and } B)$$

$$P(A \text{ and } B)=P(A)\times P(B)$$

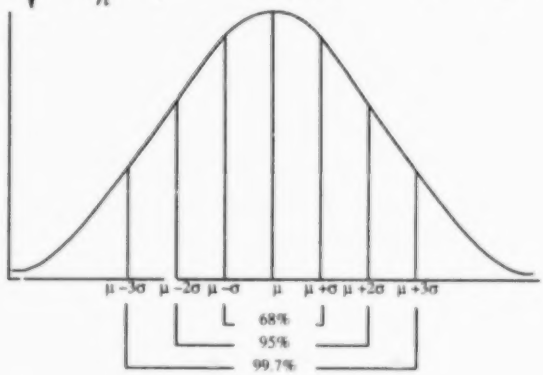
$${}_nP_r=\frac{n!}{(n-r)!}$$

$${}_nC_r=\frac{n!}{r!(n-r)!}$$

Variability and Statistics

$$z=\frac{x-\bar{x}}{\sigma} \qquad \bar{x}=\frac{\sum x}{n} \text{ or } \bar{x}=np$$

$$\sigma=\sqrt{\frac{\sum(x-\mu)^2}{n}} \qquad \sigma=\sqrt{npq} \qquad \mu=np$$



Design and Measurement

Rectangle: Area $=\ell \times w$

Circle: Area $=\pi r^2$ Circumference $=2\pi r$

Triangle: Area $=\frac{bh}{2}$

or $\sqrt{s(s-a)(s-b)(s-c)}$, where $s=\frac{a+b+c}{2}$

Trapezoid: Area $=\left(\frac{b_1+b_2}{2}\right)h$

Prism: Surface area $=Ph+2B$

Volume $=B\times h$

Pyramid: Volume $=\frac{B\times h}{3}$

Sphere: Volume $=\frac{4}{3}\pi r^3$ Surface area $=4\pi r^2$

Cylinder: Volume $=\pi r^2 h$ Surface area $=2\pi rh+2\pi r^2$

Periodic Functions

$$\text{Period}=\frac{2\pi}{\text{Frequency}} \text{ or } \frac{2\pi}{b}$$

$$y=a\sin(bx-c)+d$$

$$y=a\cos(bx-c)+d$$

SENIOR 4 APPLIED MATHEMATICS (40S)
STANDARDS TEST

DESCRIPTION

Total Possible Marks: 20 **Time: 2 hours**

This test consists of two tasks:

	Description	Suggested Time to Complete	Marks
Task 1	Contains questions on Personal Finance worth 10 marks	60 minutes	10
Task 2	Contains questions on Design and Measurement worth 10 marks	60 minutes	10

Test Resources and Directions

- This test should be written with the assistance of computer software and/or a graphing calculator.
- You are provided with a formula sheet on a detachable sheet on page 1 of this booklet.
- If you use a graphing calculator, make sure you indicate all the values you entered in the space provided in this booklet.
- If you use a spreadsheet, make sure you print two copies of your spreadsheets, one showing the answers and one showing the formulas. Indicate your booklet ID number on each printout. Remain seated and your teacher will distribute these printouts to you.
- Please staple printed copies of all work done to this booklet on the page of the question. Indicate your booklet ID number on each page. Indicate in the response space of the question that the answer is on a printed sheet.
- Clearly identify the question number on your answer sheet(s) (e.g., Question 2b).

PERSONAL FINANCE

DO NOT USE

115

Total: 10 marks

1. Ralph is graduating from high school. Since he will now be working full time, he calculates that he will be able to have $2000 saved by the end of the summer. He plans to use this money toward the purchase of a car that costs $10 000 including taxes. He recognizes that he must consider car insurance costs. He is considering two options for paying his insurance premiums:

Option A: One time per year: $1181 payment

Option B: Quarterly (four times per year): First payment of $325, then three payments of $294

Regardless of his choice, the amount of his first insurance payment must be paid from his $2000 savings. He will use the remaining savings as a down payment for the car.

Ralph can borrow the rest of the money for his car from his bank at an annual rate of 8.25% compounded monthly, over 36 months.

Compare Ralph's options in the following way:

a) Calculate the amount available for the down payment towards the car purchase: *(2 marks)*

Option A _____ Option B _____

b) Calculate the amount of the monthly payment towards the car purchase: *(3 marks)*

Option A _____ Option B _____

TVM solver values:

Option A:	Option B:
N = _____	N = _____
I% = _____	I% = _____
PV = _____	PV = _____
PMT = _____	PMT = _____
FV = _____	FV = _____
P/Y = _____	P/Y = _____
C/Y = _____	C/Y = _____
PMT = END	PMT = END

(or create your spreadsheets such as the model to follow)

DO NOT USE

Amount borrowed	Interest rate	Number of payments	Payment

c) Calculate the total cost of the car at the end of three years including the down payment, the cost of paying off the loan and the cost of the car insurance premiums.

(3 marks)

Option A _____ Option B _____

d) How much money must Ralph put aside monthly to ensure he has enough money available for his insurance payments? Show that your plan would work for both options.

(2 marks)

DESIGN AND MEASUREMENT

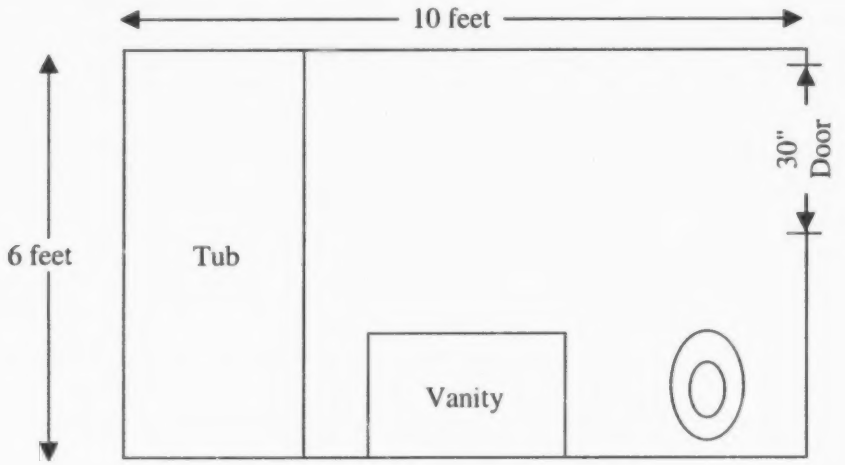
DO NOT USE

Total: 10 marks

2. You are planning to redecorate your bathroom (shown below). Your plans include painting the walls, recovering the floor and putting baseboards around the perimeter of the room.

116

Bathtub: 6 feet by 2 ½ feet, and 2 feet high
Sink vanity: 3 feet by 2 feet, and 36 inches high



a) **COST OF FLOOR COVERING:** (show your calculations in the space provided)

Vinyl flooring is sold in 6-foot widths. The area under the tub will not be covered and the flooring is to be installed in one piece. What length of flooring do you need to buy?

(1 mark)

b) **PAINT COSTS:** (show your calculations in the space provided)

DO NOT USE

The walls are 8 feet high and the dimensions of the door are 30 inches by 78 inches. The walls will require 2 coats of paint. The second coat will require $\frac{2}{3}$ as much paint as the first coat. The area behind the tub and the vanity do not need to be painted.

- Calculate the area of the walls to be painted.

A 4L can of paint covers 120 ft.^{2} at a cost of \$42.99. A 1L can of paint covers 30 ft.^{2} at a cost of \$14.99.

- What combination of cans of paint do you need to buy in order to minimize the cost? What is your final cost? Show how you arrived at your answer.

(5 marks)

DO NOT USE

c) **BASEBOARD COSTS:** (show your calculations in the space provided)

The baseboards are sold in 8-foot lengths at a cost of $5.36 each. Determine the number of 8-foot baseboards needed and calculate the total cost of the baseboards. State any assumptions that you have made.

(2 marks)

d) **BUDGET:**

You have a $300.00 budget for the entire bathroom project. How much money will you have left for the floor covering, after you have considered the paint, baseboards, GST and PST?

(2 marks)

END OF TEST

NO MARKS WILL BE AWARDED FOR WORK DONE ON THIS PAGE

NO MARKS WILL BE AWARDED FOR WORK DONE ON THIS PAGE

NO MARKS WILL BE AWARDED FOR WORK DONE ON THIS PAGE

NO MARKS WILL BE AWARDED FOR WORK DONE ON THIS PAGE

Senior 4 Applied Mathematics (40S)
Standards Test

Marking Guide

June 2003

Manitoba
Education
and Youth

Copyright © 2003, the Crown in Right of Manitoba
as represented by the Minister of Education and Youth.
Manitoba Education and Youth,
Assessment and Evaluation Branch,
Winnipeg, Manitoba R3E 3J5.

Permission is hereby granted by the copyright owner to reproduce this document on a non-profit basis for educational purposes provided the source is mentioned.

Table of Contents

General Instructions **1**

Answer Key for Multiple-choice items **5**
Marking Keys and Scoring Rubrics for Constructed-response items **7**
Marking Keys and Scoring Rubrics for the Inquiry Task **39**

Appendices **69**
A-*Table of Specific Outcome Match and Item Type* 71
B-*Generating Student Profiles* Sheet 73
C-*Sheets for marking the Inquiry Tasks* 75

General Instructions

Organization of document:

Following the general instructions for marking, the document is divided into three sections:

- Answer key for multiple-choice items
- Marking keys and scoring rubrics for constructed-response items
- Marking keys and scoring rubrics for the Inquiry Task

The first section presents the answers for the multiple-choice items in a table accompanied by the learning outcome(s) associated with each item. In the second section, each test item is presented in bold characters, followed by a series of typical and possible answers. A marking key or scoring rubric details how the marks are to be allocated for each sub-section of the question. Marking keys are used to mark restricted-response items (with or without explanations). Scoring rubrics are to be used for scoring open-response items.

For each question, the item type, the maximum number of marks possible as well as the specific outcomes targeted by the item are identified at the top of the page. Items are presented in the order that they appear on the standards test. Each open-response item as well as each Inquiry Task item is followed by a series of student exemplars. Student exemplars are chosen to exemplify the use of scoring rubrics or marking keys. The mark value allocated and a rationale justifying the mark allocation accompany each student exemplar.

General Marking Instructions

Please make no marks in the test booklets.

Please ensure that:

- each student's final result is recorded, by test booklet number, on the corresponding ***Answer/Scoring Sheet*** (computer scan sheet);
- the totals are written at the bottom;
- the *Answer/Scoring Sheet* is complete and correct;
- a copy has been made for school records; and
- **only a pencil is used to complete the *Answer/Scoring Sheets*, by both students and markers.**

Once marking is completed, please forward the *Answer/Scoring Sheets* to Manitoba Education and Youth (for more information see the *Administration Manual for Supervising Teachers*).

Scoring the Multiple-choice items

Please follow the answer key provided on page 5 of this document.

Types of student errors

As a guiding principle, students should only be penalized once for each error committed in the context of a test item. For example, students may choose an inappropriate but still relevant strategy for an item but carry it through correctly and arrive at an incorrect answer. In such cases, students should be penalized for having selected an inappropriate strategy for the task at hand but should be given credit for having arrived at an answer consistent with their choice of strategy.

Please note that for all questions in the vectors unit, allow a flexibility of ±3 mm and ±3° when marking students' scale diagrams.

Throughout this document, four types of errors have been identified. These are defined briefly below:

Trivial errors:
These are errors for which no marks are to be deducted. In order to be considered trivial, an error must be conceptually unrelated to the learning outcome(s) associated with the item and not lead to a mathematically incorrect answer. Examples include omitting labels, omitting to carry a negative sign in an algebraic task, omitting "$y =$" in an equation or not rounding final answers.

Technical communication errors:
These are errors of mathematical notation that are conceptually related to the curriculum outcomes. It is important to note, however, that such errors do not prevent students from arriving at a mathematically correct answer. Examples include omitting to use brackets on matrices, not expressing transition matrices as decimals or percentages, missing more than one vector head in a response and not stating a scale when using a scale diagram as a strategy. In such cases, students are to be penalized no more than a half mark per question for each type of error.

Minor errors:
These are errors that are generally not conceptual in nature but will inevitably lead to an incorrect answer. In such cases, students are generally penalized one mark depending on the details provided in the marking key or scoring rubric.

Major errors:
These are errors or omissions that are conceptual in nature and clearly reflect a gap in the student's knowledge of the specific learning outcome(s). These types of errors often limit the number of marks that can be awarded to a student's response.

Scoring the Constructed-response items

The respective marking key or scoring rubric should be used in conjunction with the ***Senior 4 Mathematics: Manitoba Curriculum Framework of Outcomes and Senior 4 Standards*** (Applied section) when assigning scores to student responses.

Scoring Guidelines—Restricted-response items (with or without explanation)

Each item of this type is designed to elicit a well-defined response according to the associated specific outcome(s) and relevant mathematical processes. Their purpose is to determine whether a student meets the standards for the course (level 2) as they relate to the knowledge and skills associated with the item.

To receive full marks, a student's response must be complete and correct. Partial marks may be awarded for a "relevant strategy" with execution errors. **A relevant strategy is defined as one that is consistent with the specific outcome(s) and mathematical processes associated with the item that, if properly executed, would lead to the correct answer.** Where alternative strategies are possible, the marking key makes mention of them.

It is important to note that some items require some form of explanation or justification from students. Such explanations and justifications can take various forms depending on students' learning styles. Therefore, marking of student responses needs to reflect appropriate flexibility in this regard. Test instructions to students have clearly specified that explanations or justifications can be done through labeled diagrams, in words, by showing mathematical operations for answer verification or by referencing software or a calculator program.

Scoring Guidelines—Open-response items

These items are designed to elicit student responses at any of the three levels of achievement defined in the *Senior 4 Mathematics: Manitoba Curriculum Framework of*

Outcomes and Senior 4 Standards (Applied section). The rubrics contain the language of the curricular standards in order to facilitate scoring in a manner that is consistent with those standards. The recommended procedure for scoring student responses is as follows:

1. Read the relevant specific outcome(s) in the *Senior 4 Mathematics: Manitoba Curriculum Framework of Outcomes and Senior 4 Standards* (Applied section).
2. Read the possible solution(s) provided in this document.
3. Study the student exemplars provided and the rationales for the assigned scores.
4. Carefully view all of the student's response and decide which of the three levels of achievement ("exceptional understanding", "good understanding" or "limited understanding") best applies. Whether the response clearly fits into one category or straddles two, this process will narrow down the number of possible scores that can be assigned to the response.
5. Compare the features of the student's response with the general performance indicators accompanying the mark values and the specific performance indicators (criteria) contained in the rubric. Note that the specific performance indicators only typify a student's response in a given score category. An exact match is not anticipated.

Assistance

If, during marking, any issue arises that cannot be resolved locally, please call Manitoba Education and Youth at the earliest opportunity to advise and/or seek assistance. If required, we will connect you to an advisor. Also, please be sure to notify us before making any modifications to the answer/marking keys or scoring rubrics.

Contact person: Ken Clark at 945-3666 or Philippe Le Dorze at 945-0670 (1 800 282-8069, extensions 3666 or 0670 respectively)

Answer Key
for Multiple-choice items

Question No.	Answer	Outcome
1	D	A1
2	C	A1
3	B	B1
4	B	D2
5	A	D4
6	D	E2
7	C	E2
8	D	H1
9	A	H1

Marking Keys and Scoring Rubrics for Constructed-response items

Specific Outcomes: A1, A2 **Item Type: Open Response**

Question No. 10 and Answer

Total: 6 marks

A small commercial fishing community has a work force of 1800 people. During the commercial fishing season 1580 people were employed full time, 125 were employed part time and the remainder were unemployed.

Once the fishing season is over:

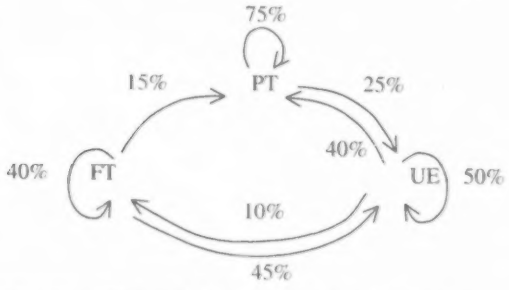
Of the full time employees:
- **45% will become unemployed**
- **15% will begin working part time**
- **the remainder continue full time employment**

Of the part time employees:
- **25% will become unemployed**
- **the remainder will continue part time employment**

Of the unemployed:
- **10% will find full time employment**
- **40% will find part time employment**
- **the remainder will continue to be unemployed.**

a) **Draw a transition diagram to represent these changes.**

(1 mark)



b) **Create a transition matrix representing this situation.**

(2 marks)

$$[B] = \begin{array}{c} \\ \text{FT} \\ \text{PT} \\ \text{UE} \end{array} \begin{array}{c} \begin{array}{ccc} \text{FT} & \text{PT} & \text{UE} \end{array} \\ \begin{bmatrix} 0.40 & 0.15 & 0.45 \\ 0.00 & 0.75 & 0.25 \\ 0.10 & 0.40 & 0.50 \end{bmatrix} \end{array}$$

c) **Create a row matrix showing the initial distribution. Show a matrix operation to determine the distribution of workers during the next off-season.**

(1 mark)

$$\begin{array}{c} A = \\ \end{array} \begin{array}{c} \begin{array}{ccc} \text{FT} & \text{PT} & \text{UE} \end{array} \\ \begin{bmatrix} 1580 & 125 & 95 \end{bmatrix} \end{array} \qquad [A] * [B] = \begin{array}{c} \begin{array}{ccc} \text{FT} & \text{PT} & \text{UE} \end{array} \\ \begin{bmatrix} 642 & 369 & 790 \end{bmatrix} \end{array}$$

or [641 368 789]

d) **If this trend continues, what will be the number of full time, part time and unemployed workers once it stabilizes?**

(1 mark)

$$A * B^{100} = \begin{array}{c} \begin{array}{ccc} \text{FT} & \text{PT} & \text{UE} \end{array} \\ \begin{bmatrix} 104.7 & 1067.4 & 627.9 \end{bmatrix} \end{array}$$

$$A * B^{101} = \begin{array}{c} \begin{array}{ccc} \text{FT} & \text{PT} & \text{UE} \end{array} \\ \begin{bmatrix} 104.7 & 1067.4 & 627.9 \end{bmatrix} \end{array}$$

FT = 105
PT = 1067
UE = 628

e) **Identify one factor that could affect the validity of your answer to part d).**

(1 mark)

This trend will not always continue.
This is only during the off season.

OR

Over-fishing of lake by those going over their quota.

Scoring Rubric

	Score and General Performance Indicators	Specific Performance Indicators/Criteria
Level 1 limited understanding	**1** **weak attempt, inappropriate strategy or no strategy**	- 1 criterion correct
	2 **reasonable attempt, appropriate strategy with major errors or omissions**	- 2 criteria correct
Level 2 good understanding	**3** **reasonable strategy, minor errors and/or omissions**	- 3 criteria correct
	4 **sound strategy, mostly complete, minor errors**	- 4 criteria correct
	5 **almost complete and correct**	- 5 criteria correct
Level 3 exceptional understanding	**6** **complete and correct, reflecting exceptional understanding**	- 6 criteria correct

Criteria:

1) 1 mark for the correct answer in a) (complements are not necessary)
2) 1 mark for the correct diagonal in b)
3) 1 mark for the other correct values in b)
*4) 1 mark for the correct answer in c) or correct matrix operation shown**
5) 1 mark for the correct answer in d)
6) 1 mark for the correct answer in e)

Marker Notes:

- **For part c), no marks awarded for initial distribution matrix.*
- *Maximum ½ mark deduction for each kind of technical communication error (see page 2 of this guide).*
- *In b), deduct ½ mark if the transition matrix does not display decimals or percentages.*
- *No deduction if answers are rounded up or down.*

Student exemplar 1

Total: 6 marks

A small commercial fishing community has a work force of 1800 people. During the commercial fishing season 1580 people were employed full time, 125 were employed part time and the remainder were unemployed.

Once the fishing season is over:

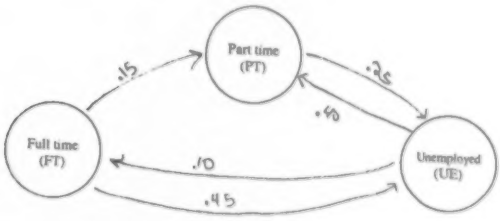
Of the full time employees:
- 45% will become unemployed
- 15% will begin working part time
- the remainder continue full time employment

Of the part time employees:
- 25% will become unemployed
- the remainder will continue part time employment

Of the unemployed:
- 10% will find full time employment
- 40% will find part time employment
- the remainder will continue to be unemployed.

a) Draw a transition diagram to represent these changes.

(1 mark)



b) Create a transition matrix representing this situation.

(2 marks)

$$T = \begin{array}{c} \\ FT \\ PT \\ UE \end{array} \begin{array}{c} \begin{array}{ccc} FT & PT & UE \end{array} \\ \begin{bmatrix} .40 & .15 & .45 \\ 0 & .75 & .25 \\ .10 & .40 & .50 \end{bmatrix} \end{array}$$

c) Create a row matrix showing the initial distribution. Show a matrix operation to determine the distribution of workers during the next off-season.

(1 mark)

$$A = \begin{array}{c} \begin{array}{ccc} FT & PT & UE \end{array} \\ \begin{pmatrix} 1580 & 125 & 95 \end{pmatrix} \end{array}$$

d) If this trend continues, what will be the number of full time, part time and unemployed workers once it stabilizes?

(1 mark)

e) Identify one factor that could affect the validity of your answer to part d).

(1 mark)

There could be better job opportunities elsewhere, so people may move away from the fishing industry

4 marks:
- 1 mark for a)
- 2 marks for b)
- 1 mark for e)

Student exemplar 2

Total: 6 marks

A small commercial fishing community has a work force of 1800 people. During the commercial fishing season 1580 people were employed full time, 125 were employed part time and the remainder were unemployed.

Once the fishing season is over:

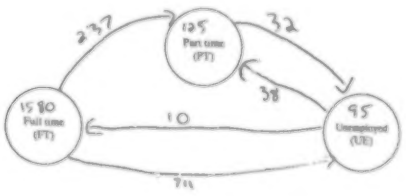
Of the full time employees:
- 45% will become unemployed
- 15% will begin working part time
- the remainder continue full time employment

Of the part time employees:
- 25% will become unemployed
- the remainder will continue part time employment

Of the unemployed:
- 10% will find full time employment
- 40% will find part time employment
- the remainder will continue to be unemployed.

a) Draw a transition diagram to represent these changes.

(1 mark)



b) Create a transition matrix representing this situation.

(2 marks)

$$T = \begin{matrix} \\ FT \\ PT \\ UE \end{matrix} \begin{matrix} \begin{matrix} FT & PT & UE \end{matrix} \\ \begin{bmatrix} .4 & .45 & .15 \\ 0 & .25 & .35 \\ .10 & .40 & .5 \end{bmatrix} \end{matrix}$$

$$T = \begin{matrix} \\ FT \\ PT \\ UE \end{matrix} \begin{matrix} \begin{matrix} FT & PT & UE \end{matrix} \\ \begin{bmatrix} 632 & 237 & 711 \\ 0 & 93 & 32 \\ 10 & 79 & 47 \end{bmatrix} \end{matrix}$$

c) Create a row matrix showing the initial distribution. Show a matrix operation to determine the distribution of workers during the next off-season.

(1 mark)

$$I = \begin{matrix} \begin{matrix} FT & PT & UE \end{matrix} \\ \begin{bmatrix} 1580 & 125 & 95 \end{bmatrix} \end{matrix}$$

$$[I] * [T]$$

d) If this trend continues, what will be the number of full time, part time and unemployed workers once it stabilizes?

(1 mark)

FT = 642.00
PT = 368.00
UE = 790.00

e) Identify one factor that could affect the validity of your answer to part d).

(1 mark)

Lay-offs due to lack of business

5 marks:
- 1 mark for a)
- 2 marks for b) despite trivial error in matrix
- 1 mark each for c) and e)

Student exemplar 3

Total: 6 marks

A small commercial fishing community has a work force of 1800 people. During the commercial fishing season 1580 people were employed full time, 125 were employed part time and the remainder were unemployed.

Once the fishing season is over:

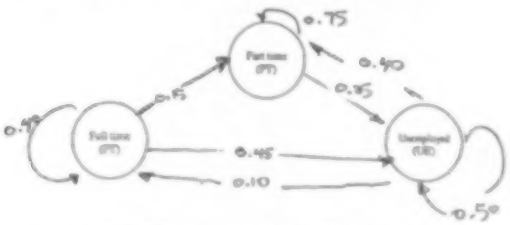
Of the full time employees:
- 45% will become unemployed
- 15% will begin working part time
- the remainder continue full time employment

Of the part time employees:
- 25% will become unemployed
- the remainder will continue part time employment

Of the unemployed:
- 10% will find full time employment
- 40% will find part time employment
- the remainder will continue to be unemployed.

a) Draw a transition diagram to represent these changes.

(1 mark)



b) Create a transition matrix representing this situation.

(2 marks)

$$T = \begin{array}{c} \\ FT \\ PT \\ UE \end{array} \begin{array}{c} \begin{array}{ccc} FT & PT & UE \end{array} \\ \begin{bmatrix} 0.40 & 0.15 & 0.45 \\ 0 & 0.75 & 0.25 \\ 0.10 & 0.40 & 0.50 \end{bmatrix} \end{array}$$

* not in proper

c) Create a row matrix showing the initial distribution. Show a matrix operation to determine the distribution of workers during the next off-season.

(1 mark)

$$S = \begin{bmatrix} FT & PT & UE \\ 1580 & 125 & 95 \end{bmatrix}$$

$$S \cdot T = \begin{bmatrix} FT & PT & UE \\ 642 & 369 & 77 \end{bmatrix}$$

d) If this trend continues, what will be the number of full time, part time and unemployed workers once it stabilizes?

(1 mark)

$$S \cdot T^{10} = \begin{bmatrix} FT & PT & UE \\ 105 & 1067 & 628 \end{bmatrix}$$

e) Identify one factor that could affect the validity of your answer to part d).

(1 mark)

The number of fish in the sea. If there are little or no fish, not alot of people will have to be employed; while on the other hand, if the fish is plentiful more people will be required to fish, meaning more jobs are available

6 marks:
- Trivial error in c)

Specific Outcomes: A2 **Item Type: Restricted Response with Explanation**

Question No. 11 and Answer

Total: 3 marks

The following matrix represents the number of direct roads joining four different communities A, B, C, and D.

$$R = \begin{array}{c} \\ A \\ B \\ C \\ D \end{array} \begin{array}{c} \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 \end{bmatrix} \end{array}$$

a) Create a matrix showing the number of ways of driving to any community directly or by going through at most one other community. Show the matrix operations you used to arrive at your answer.

(2 marks)

$$\begin{array}{c} \\ A \\ B \\ C \\ D \end{array} \begin{array}{c} \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 \end{bmatrix}^2 \end{array} + \begin{array}{c} \\ A \\ B \\ C \\ D \end{array} \begin{array}{c} \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 \end{bmatrix} \end{array} = \begin{array}{c} \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{bmatrix} 2 & 2 & 0 & 2 \\ 2 & 2 & 0 & 2 \\ 0 & 0 & 0 & 0 \\ 2 & 2 & 0 & 2 \end{bmatrix} \end{array}$$

OR

$$\begin{array}{c} \\ A \\ B \\ C \\ D \end{array} \begin{array}{c} \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{bmatrix} 2 & 1 & 0 & 1 \\ 1 & 2 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 2 \end{bmatrix} \end{array} \overset{(R^2)}{} + \begin{array}{c} \\ A \\ B \\ C \\ D \end{array} \begin{array}{c} \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 \end{bmatrix} \end{array} \overset{(R)}{} = \begin{array}{c} \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{bmatrix} 2 & 2 & 0 & 2 \\ 2 & 2 & 0 & 2 \\ 0 & 0 & 0 & 0 \\ 2 & 2 & 0 & 2 \end{bmatrix} \end{array}$$

OR

$$R + R^2 = \begin{array}{c} \\ A \\ B \\ C \\ D \end{array} \begin{array}{c} \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{bmatrix} 2 & 2 & 0 & 2 \\ 2 & 2 & 0 & 2 \\ 0 & 0 & 0 & 0 \\ 2 & 2 & 0 & 2 \end{bmatrix} \end{array}$$

b) What can you conclude about community C?

(1 mark)

Community C is not accessible

Marker Notes:

- *If student only calculates R^2, award 1 mark.*
- *Maximum ½ mark deduction for each kind of technical communication error (see page 2 of this guide)*

Marking Key
1 mark for work shown indicating an appropriate strategy in a)
1 mark for correct answer in a)
1 mark for correct answer in b) consistent with answer in a)

Question No. 12 and Answer

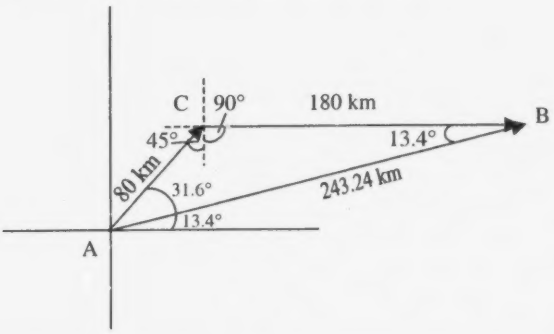
Heather drives 80 km north-east. She then turns east and drives for 180 km.

Total: 4 marks

a) Provide a well-labelled sketch of the situation and determine how far she is from her starting point. Show how you arrived at your answer.

(3 marks)

Scale: 1 cm = 30 km



OR

TriSolve:

Input:	Output:
a = 180 km	c = 243.24 km
b = 80 km	A = 31.6°
C = 135°	B = 13.4°

Resultant distance: 243.24 km
In direction: E 13.4° N

b) If she had driven directly to her destination at 80 km/hr, how long would it have taken her to reach her destination?

(1 mark)

At 80 km/hr, it would have taken her: $\frac{243.24 \text{ km}}{80 \text{ km/hr}} = 3.04 \text{ hrs}$

Marker Notes:

- *For scale diagrams, please allow ± 3° and ± 3 mm flexibility.*
- *If no arrows are indicated, please deduct 0.5 mark for a technical communication error.*
- *Maximum ½ mark deduction for each kind of technical communication error (see page 2 of this guide)*
- *Other strategies are possible (e.g., trigonometry or computer software)*

Marking Key
1 mark for a reasonable sketch in a)
1 mark for work shown indicating an appropriate strategy or answer in a)
1 mark for the calculation of the distance in a)
1 mark for the correct conversion in b) consistent with answer in a)

BLANK PAGE

Specific Outcomes: B2, B3 **Item Type: Open Response**

Question No. 13 and Answer

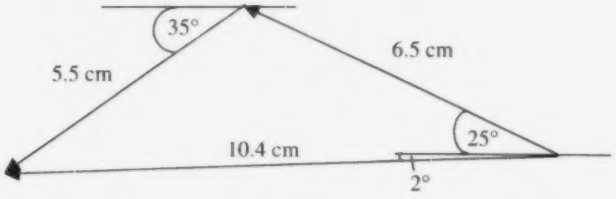
Total: 6 marks

An airplane flies from Winnipeg to Edmonton, a distance of 1300 km in a direction of W 25° N. Then, it flies from Edmonton to Vancouver, a distance of 1100 km in a direction of W 35° S.

a) What is the shortest distance between Vancouver and Winnipeg? Provide a labelled sketch of the situation.

(3 marks)

Scale: 1 cm = 200 km

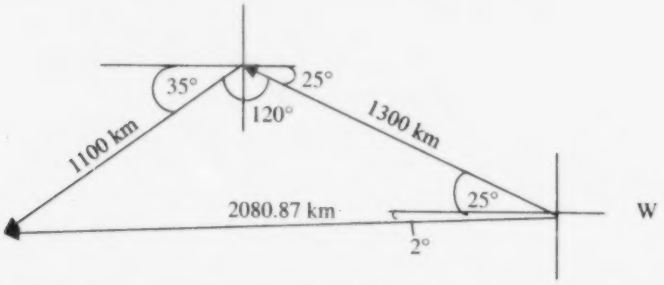


Vancouver is 2080 km from Winnipeg.

OR

$a^2 = b^2 + c^2 - 2bc\ cosA$

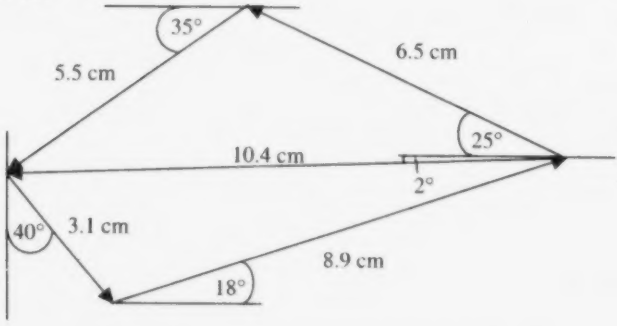
$= 1300^2 + 1100^2 - 2(1300)(1100)\ \cos 120°$



b) The flight returns to Winnipeg from Vancouver with no stops. In order to avoid a storm near Vancouver, the airplane must begin its flight in a direction of S 40° E. Design and describe the flight completely including all distances and directions.

(3 marks)

Scale: 1 cm = 200 km



One possible route would be to fly 620 km in a direction of S 40° E from Vancouver and then turn and fly 1780 km in a direction of E 18° N.

Scoring Rubric

	Score and General Performance Indicators	Specific Performance Indicators/Criteria
Level 1 limited understanding	**1** **weak attempt, inappropriate strategy or no strategy**	- 1 criterion correct
	2 **reasonable attempt, appropriate strategy with major errors or omissions**	- 2 criteria correct
Level 2 good understanding	**3** **reasonable strategy, minor errors and/or omissions**	- 3 criteria correct
	4 **sound strategy, mostly complete, minor errors**	- 4 criteria correct
	5 **almost complete and correct**	- 5 criteria correct
Level 3 exceptional understanding	**6** **complete and correct, reflecting exceptional understanding**	- 6 criteria correct

Criteria:

1) 1 mark for correct diagram in a)
2) 1 mark for work shown indicating an appropriate strategy in a)
3) 1 mark for correct distance in a) or consistent with the diagram in a)
4) 1 mark for a reasonable diagram or description of alternate route starting at S 40° E in b)
5) 1 mark for correct calculation of direction in b) consistent with diagram in a)
6) 1 mark for correct calculation of distance in b) consistent with diagram in a)

Marker Notes:

- *Other answers are possible in b).*
- *Maximum ½ mark deduction for each kind of technical communication error (see page 2 of this guide).*
- *Other strategies are possible (TriSolve or other graphing calculator programs or computer software).*

Student exemplar 1

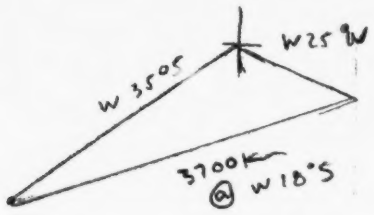
Total: 6 marks

An airplane flies from Winnipeg to Edmonton, a distance of 1300 km in a direction of W 25° N. Then, it flies from Edmonton to Vancouver, a distance of 1100 km in a direction of W 35° S.

a) What is the shortest distance between Vancouver and Winnipeg? Provide a labelled sketch of the situation.

(3 marks)

1cm : 500 km



7.4

W 10°S for a Distance of 3700 km

b) The flight returns to Winnipeg from Vancouver with no stops. In order to avoid a storm near Vancouver, the airplane must begin its flight in a direction of S 40° E. Design and describe the flight completely including all distances and directions.

(3 marks)

2 marks:
- 1 mark for strategy in a)
- 1 mark for correct answer in a) based on incorrect diagram

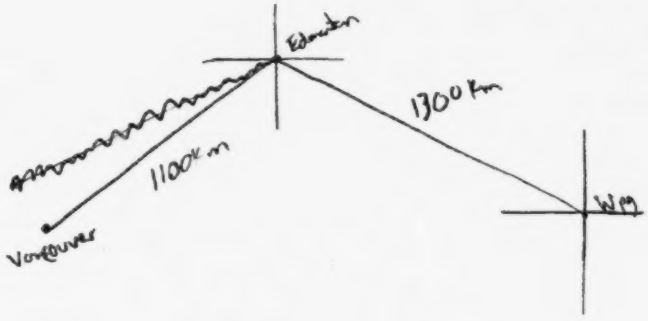
Student exemplar 2

Total: 6 marks

An airplane flies from Winnipeg to Edmonton, a distance of 1300 km in a direction of W 25° N. Then, it flies from Edmonton to Vancouver, a distance of 1100 km in a direction of W 35° S.

a) What is the shortest distance between Vancouver and Winnipeg? Provide a labelled sketch of the situation.

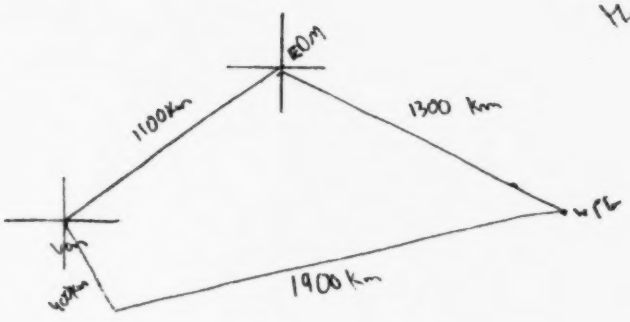
(3 marks)



b) The flight returns to Winnipeg from Vancouver with no stops. In order to avoid a storm near Vancouver, the airplane must begin its flight in a direction of S 40° E. Design and describe the flight completely including all distances and directions.

(3 marks)

given =
400 km to get around the storm



2 marks:

- 1 mark for strategy in a), 0.5 deduction for no scale stated
- 1 mark for diagram in b), 0.5 deduction for missing arrowheads
- 1 mark for distances in b)

Student exemplar 3

Total: 6 marks

An airplane flies from Winnipeg to Edmonton, a distance of 1300 km in a direction of W 25° N. Then, it flies from Edmonton to Vancouver, a distance of 1100 km in a direction of W 35° S.

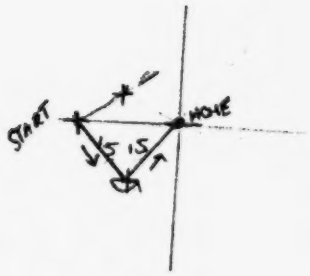
a) What is the shortest distance between Vancouver and Winnipeg? Provide a labelled sketch of the situation.

(3 marks)

to go straight East back to Wpg. is 2100km.

b) The flight returns to Winnipeg from Vancouver with no stops. In order to avoid a storm near Vancouver, the airplane must begin its flight in a direction of S 40° E. Design and describe the flight completely including all distances and directions.

(3 marks)



From Van. head S 40°E for 1500km then turn N 43°E for 1500km to get to Wpg with a total distance of 3000km.

5.5 marks:

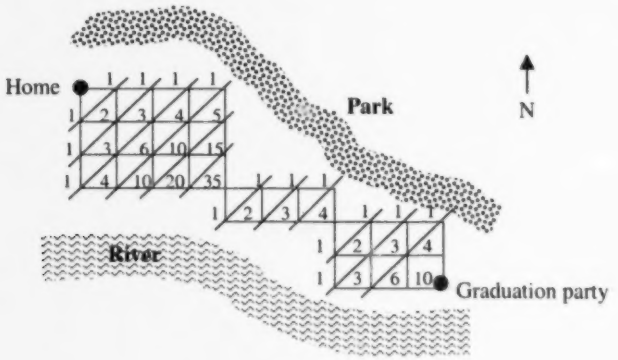
- Complete and correct when allowing ± 3mm/± 3° for scale drawings
- Minus 0.5 mark for no scale stated (1 cm = 1000 km)

Question No. 14 and Answer

Ryan and Malika leave home and take a taxi to their Graduation party.

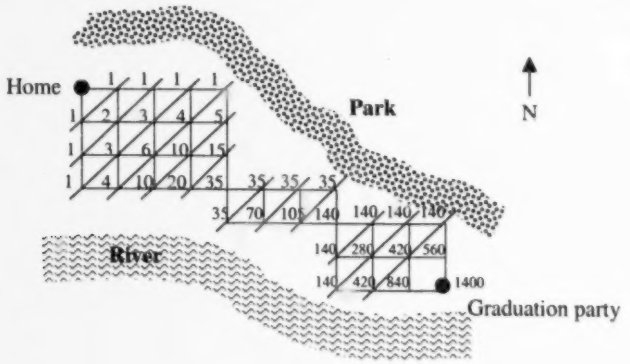
Total: 2 marks

Calculate how many different routes the taxi driver can follow to take them to their party. Assume he can only drive south or east. Show how you arrived at your answer.



Taxi driver can take them $35 \times 4 \times 10 = 1400$ ways

OR



There are 1400 ways

Marking Key
1 mark for work shown indicating an appropriate strategy (e.g. any illustration by the student)
1 mark for the correct answer

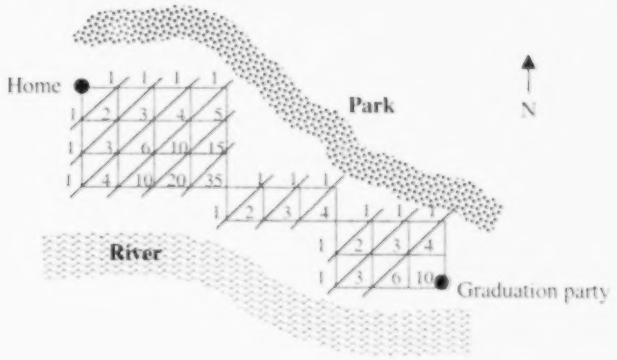
Specific Outcomes: D1 **Item Type: Restricted Response**

Question No. 14 and Answer

Ryan and Malika leave home and take a taxi to their Graduation party.

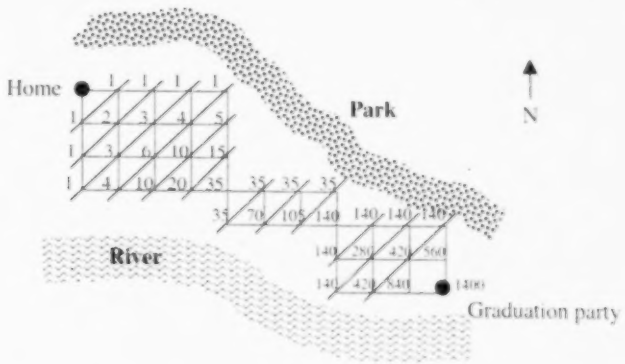
Total: 2 marks

Calculate how many different routes the taxi driver can follow to take them to their party. Assume he can only drive south or east. Show how you arrived at your answer.



Taxi driver can take them $35 \times 4 \times 10 = 1400$ ways

OR



There are 1400 ways

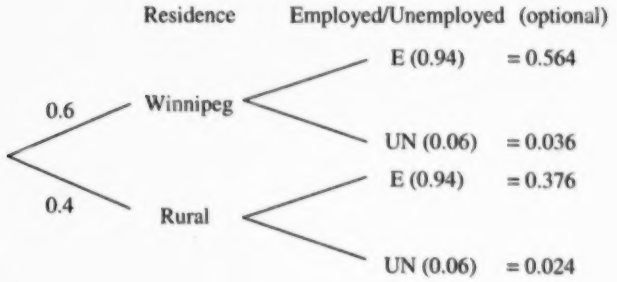
Marking Key
1 mark for work shown indicating an appropriate strategy (e.g. any illustration by the student)
1 mark for the correct answer

Question No. 15 and Answer

Total: 2 marks

We know that 60% of Manitoba's workforce lives in Winnipeg. The provincial unemployment rate is 6%.

What is the probability that a randomly selected member of the workforce lives outside Winnipeg and is unemployed? Show how you arrived at your answer.



OR

Sample space

{W, UN; W, E; R, UN; R, E}

P (Rural, unemployed) = P (Rural) × P (unemployed)

= 0.4 × 0.06

= 0.024

Marking Key
1 mark for work shown indicating an appropriate strategy
1 mark for correct probability

Question No. 16 and Answer

Total: 3 marks

In a game of chance, there are two containers. You are blindfolded and you select one ball from each container.

One container has 2 green balls and 8 red balls. The other container has 7 green balls and 3 red balls. To win a prize, you have to pick 1 red ball and 1 green ball.

a) What is the probability of you winning a prize?

(2 marks)

$$P(R_1 \times G_2) + P(G_1 \times R_2)$$
$$= \left(\frac{8}{10} \times \frac{7}{10}\right) + \left(\frac{2}{10} \times \frac{3}{10}\right)$$
$$= \frac{56}{100} + \frac{6}{100}$$
$$= \frac{62}{100} = 62\%$$

OR

$$(0.2 \times 0.3) + (0.8 \times 0.7)$$
$$0.06 + 0.56$$
$$= 0.62$$

b) In a similar game, all the balls are in one container. Balls are replaced after each draw. Explain how this would change the calculation of the probability of winning a prize.

(1 mark)

There would be a lesser chance of winning if all balls were placed in a single container because in the first game one container has mostly green balls and the other mostly red ones.

OR

$\frac{9}{20} \times \frac{11}{20} = 0.2475 \times 2 = 49.5\%$ less chances to win in the second game.

Marking Key
1 mark for correct strategy in a) (at least one step, e.g., $P(R_1 \times G_2) = 0.56$)
1 mark for correct answer in a)
1 mark for correct explanation in b)

Question No. 17 and Answer

Total: 5 marks

Restaurant A sells french fries. A sample of 100 servings of fries is selected at random. The masses of these servings are measured and found to be normally distributed. The table below shows the data:

Masses (in grams)	107.7	110.6	113.4	116.2	119.1
Frequency	1	15	66	16	2

a) **Determine the mean and the population standard deviation of these data.**

(2 marks)

$\bar{x} = 113.485$ or 113.49

$\sigma = 1.84$

b) **Based on the mean and the population standard deviation of the sample above, predict the percentage of servings weighing more than 116.2 grams.**

(2 marks)

z-score of 116.2 grams = 1.476
percentage over 116.2 grams = 0.07 = 7%

Normal CDF (116.2, E99, 113.49, 1.84)

c) **Restaurant B sells fries for the same price. The masses of the servings of fries at this restaurant are also normally distributed with a mean and population standard deviation of:**

(1 mark)

$\bar{x} = 113.4$ **grams**

$\sigma = 13.6$ **grams**

From which restaurant would you buy your fries? Support your answer statistically.

A because less likely to get small order due to more consistent sizes (low σ)

OR

Restaurant B because they are hoping with a higher standard deviation they may get more french fries (ie., $\bar{x} + \sigma = 127.01$).

Incomplete answer (minus 1 mark)

(if only mass used)
a)
$\bar{x} = 113.4$
$\sigma x = 4.02$

b)
$z = 0.697$
percentage over 116.2 = 24.3%

(if only frequency used)
a)
$\bar{x} = 20$
$\sigma x = 23.84$

b)
$z = 4.04$
percentage over 116.2 = 0.015%

Scoring Rubric

	Score and General Performance Indicators	Specific Performance Indicators/Criteria
Level 1 limited understanding	**1** **weak attempt, inappropriate strategy or no strategy**	- 1 criterion correct
	2 **reasonable attempt, appropriate strategy with major errors or omissions**	- 2 criteria correct
Level 2 good understanding	**3** **reasonable strategy, minor errors and/or omissions**	- 3 criteria correct
	4 **sound strategy, mostly complete, minor errors**	- 4 criteria correct
Level 3 exceptional understanding	**5** **complete and correct, reflecting exceptional understanding**	- 5 criteria correct

Criteria:

1) 1 mark for the correct calculation of mean in a)
2) 1 mark for the correct calculation of standard deviation in a)
3) 1 mark for work shown indicating an appropriate strategy
4) 1 mark for the correct calculation of percent larger than 116.2 grams in b)
5) 1 mark for a supported answer in c)

Marker Notes:

- *If student makes an error in any one part and is consistent with his/her error - only penalize once.*
- *If student uses only mass or frequency, award one mark in a).*

Student exemplar 1

Total: 5 marks

Restaurant A sells french fries. A sample of 100 servings of fries is selected at random. The masses of these servings are measured and found to be normally distributed. The table below shows the data:

Masses (in grams)	107.7	110.6	113.4	116.2	119.1
Frequency	1	15	66	16	2

a) Determine the mean and the population standard deviation of these data.

(2 marks)

$\bar{x} = 113.40$

$\sigma = 4.02.$

b) Based on the mean and the population standard deviation of the sample above, predict the percentage of servings weighing more than 116.2 grams.

(2 marks)

11.98

c) Restaurant B sells fries for the same price. The masses of the servings of fries at this restaurant are also normally distributed with a mean and population standard deviation of:

(1 mark)

$\bar{x} = 113.4$ grams

$\sigma = 13.6$ grams

From which restaurant would you buy your fries? Support your answer statistically.

Restaurant "B" because there is a better chance of getting more.

1 mark:

- 1 mark for correct calculation of mean and standard deviation in a) based on mass only
- No marks for b)
- No marks for c) - lacking statistical support

Student exemplar 2

Total: 5 marks

Restaurant A sells french fries. A sample of 100 servings of fries is selected at random. The masses of these servings are measured and found to be normally distributed. The table below shows the data:

Masses (in grams)	107.7	110.6	113.4	116.2	119.1
Frequency	1	15	66	16	2

a) Determine the mean and the population standard deviation of these data.

(2 marks)

Mean = $\bar{x}$ = 113.4

POP standard deviation = σx = 4.02

b) Based on the mean and the population standard deviation of the sample above, predict the percentage of servings weighing more than 116.2 grams.

(2 marks)

$z\text{score} = \frac{116.2 - 113.4}{4.02} = .6965$

zscore of .6965 gives .2580

greater than 116.2 = .5 − .2580 = 24.20%

c) Restaurant B sells fries for the same price. The masses of the servings of fries at this restaurant are also normally distributed with a mean and population standard deviation of:

(1 mark)

$\bar{x}$ = 113.4 grams

σ = 13.6 grams

From which restaurant would you buy your fries? Support your answer statistically.

I would buy from A

Because there is less variance in the size of the fries.

A varies from 109.38 to 117.42 60% prob of having less between

well B has 99.8 − B. 99.8 ± 17 (60% / 60%)

A. 109.38 − 117.42

4 marks:

- 1 mark for mean and standard deviation based on mass only
- 2 marks for correct percentage and z-score based on error in a)
- 1 mark for correct support in c)

Student exemplar 3

Total: 5 marks

Restaurant A sells french fries. A sample of 100 servings of fries is selected at random. The masses of these servings are measured and found to be normally distributed. The table below shows the data:

Masses (in grams)	107.7	110.6	113.4	116.2	119.1
Frequency	1	15	66	16	2

a) Determine the mean and the population standard deviation of these data.

(2 marks)

I used 1-var stat on the TI-83 & imputed data in L_1 & L_2.

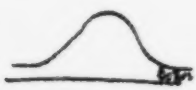
$\bar{x} = 113.4$

$\sigma x = 1.84$

b) Based on the mean and the population standard deviation of the sample above, predict the percentage of servings weighing more than 116.2 grams.

(2 marks)

z-score $\frac{116.2 - 113.4}{1.84} = 1.5$



.0668 = 6.68% Shadenorm (1.5, 5) over 116.2

c) Restaurant B sells fries for the same price. The masses of the servings of fries at this restaurant are also normally distributed with a mean and population standard deviation of:

(1 mark)

$\bar{x} = 113.4$ grams

$\sigma = 13.6$ grams

From which restaurant would you buy your fries? Support your answer statistically.

I would select restaurant A, because in B, the σ is very high which is inconsistency. You may be lucky and get a large fries, or you could get ripped off - get a small serving. Be with consistency for your wallet's sake.

5 marks:
- Complete and correct

Question No. 18 and Answer

In a recent study, researchers found that 65% of all drivers speed regularly. A local insurance company decides to randomly check the speeds of 360 passing cars.

Total: 4 marks

a) Calculate the mean and standard deviation for the number of drivers who speed regularly.

(2 marks)

$\bar{x} = np$ $\qquad$ $\sigma = \sqrt{npq}$

$\bar{x} = (360)(0.65)$ $\qquad$ $\sigma = \sqrt{360(0.65)(0.35)}$

$\bar{x} = 234$ $\qquad$ $\sigma = 9.05$

b) Find the 95% confidence interval for the number of cars the insurance company should expect to find speeding.

(1 mark)

95% confidence interval = $\pm$ 1.96σ
234 + 1.96 (9.05) = 251.74
234 – 1.96 (9.05) = 216.26
Confidence interval is (216.26, 251.74)

OR

1 Prop z int on TI-83
$\bar{x}$: 360 × 0.65 = 234 $\qquad$ (0.60073, 0.69927)
n: 360 $\qquad$ 360 × 0.60073 = 216.26
c level: 95 $\qquad$ 360 × 0.69927 = 251.74
Calculate

c) Explain the meaning of this confidence interval.

(1 mark)

The insurance company can be 95% certain that they will find between 216 and 252 cars speeding.

Marker Notes:

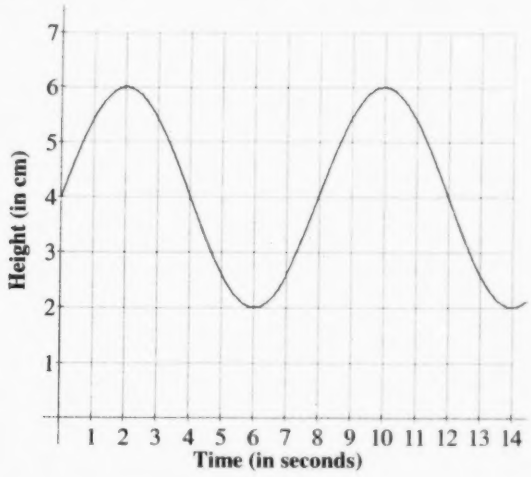
- *$\pm 2\sigma$ can be used in place of $\pm 1.96\sigma$ (215.9, 252.1)*

Marking Key
1 mark for the correct answer for mean
1 mark for the correct answer for standard deviation
1 mark for correct confidence interval
1 mark for correct explanation

Question No. 19 and Answer

Total: 2 marks

A weight is suspended on a spring above a tabletop. The height (in cm) varies sinusoidally with time (in seconds). The data is presented in the following graph.



What is the equation of the sinusoidal function?

sin reg:

$y = a\sin(bx + c) + d$

$a = 2$

$b = 0.79$

$c = 0$

$d = 4$

or $y = 2\sin 0.79x + 4$

or $y = 2\sin\left(\frac{\pi}{4}x\right) + 4$

OR

Manual Solution:

Maximum: 6.00

Minimum: 2.00

→ Amplitude: 2

Vertical shift: 4

→ Period: 8

$b = \frac{\pi}{4}$ i.e., $\frac{2\pi}{8} = \frac{\pi}{4}$

$\therefore y = 2\sin\left(\frac{\pi}{4}x\right) + 4$

Marking Key
1 mark for work shown indicating an appropriate strategy (i.e., any two numbers correct in the equation) *1 mark for the correct equation presented*

Specific Outcomes: G2, G3 **Item Type: Restricted Response with Explanation**

Question No. 20 and Answer

Total: 3 marks

The following data show how the depth of water at Qualicum Beach, BC, varies during one particular day due to the tides.

Time (hrs)	1	3	5	9	11.5
Depth (metres)	2.3	4.7	5.3	1.3	0.6

a) Find an equation of the sinusoidal curve of best fit for this data.

(1 mark)

$$y = 2.50\sin(0.51x - 0.74) + 2.90$$

Note: Manual solution $y = 2.4\sin\left(\frac{2\pi}{12}(x - 1.5)\right) + 3$

b) Graph your equation to determine the length of time the depth of water is below 1 m in the first 12 hours. Explain how you arrived at your answer.

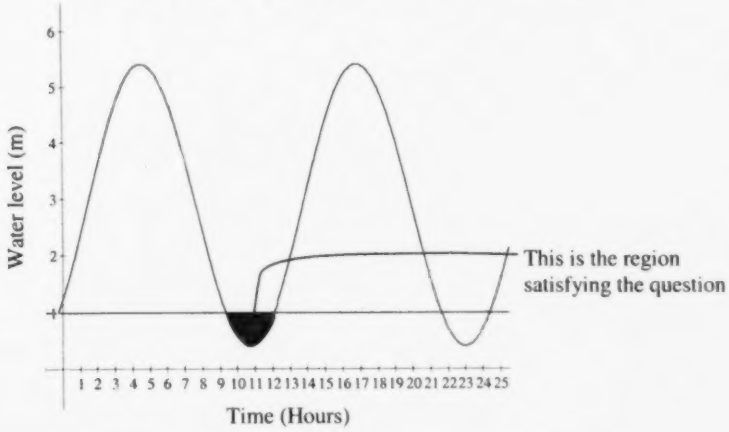
(2 marks)

Using a graphing calculator enter the equation y = 1. Now find the intersection points of it with the graph of the data from the table.

There are intersections at $x = 9.31$ and 12.09. Therefore the total time the water level is below 1 m is 2.78 hours.

$$(12.09 - 9.31) = 2.78 \text{ hours}^*$$

(this answer is found using the regression equation with all decimal places)

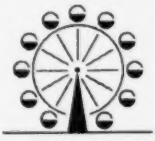

Water level (m)
6
5
4
3
2
1
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Time (Hours)
This is the region satisfying the question

*Answers may vary depending on where rounding occurred.

(If using the rounded curve then answer is 2.67 hours.)

Marking Key
1 mark for the correct equation in a)
1 mark for work shown indicating an appropriate strategy in b)
1 mark for correct answer in b)

Question No. 21 and Answer



Total: 5 marks

Two Ferris wheels are located at a carnival. The first rotates according to the model $y = 10\sin(0.105x - 1.571) + 11$ and the second rotates according to the model $y = 4\sin(0.262x - 1.571) + 5$ (where x is measured in seconds and y is measured in metres).

a) What is the maximum height attained by the first Ferris wheel?

(1 mark)

21 m (10 m + 11 m)

b) How long does it take the second Ferris wheel to complete one full revolution? Show how you arrived at your answer.

(2 marks)

$\frac{2\pi}{0.262} = 24$ seconds

OR

Find 2 consecutive maximum or minimum values and subtract the x-values

$35.97 - 11.99 = 23.98$

Answer is 24 seconds

c) Each ride costs $3.00 and lasts approximately 5 minutes. Compare the two rides to determine which you would rather take. Use periodic data to support your choice.

(2 marks)

I chose ride 2 because I'm afraid of heights and ride one goes to a height of 21 m and ride 2 goes to a height of 9 m.

OR

I chose ride one because it revolves 5 times in 5 minutes and the other revolves 12.5 times in 5 minutes.

Scoring Rubric

	Score and General Performance Indicators	Specific Performance Indicators/Criteria
Level 1 limited understanding	**1** **weak attempt, inappropriate strategy or no strategy**	- 1 criterion correct
	2 **reasonable attempt, appropriate strategy with major errors or omissions**	- 2 criteria correct
Level 2 good understanding	**3** **reasonable strategy, minor errors and/or omissions**	- 3 criteria correct
	4 **sound strategy, mostly complete, minor errors**	- 4 criteria correct
Level 3 exceptional understanding	**5** **complete and correct, reflecting exceptional understanding**	- 5 criteria correct

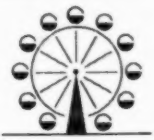
Criteria:

1) 1 mark for the correct answer in a)
2) 1 mark for work shown indicating an appropriate strategy in b)
3) 1 mark for correct answer in b)
4) 1 mark for correct comparison
5) 1 mark for supporting your choice with periodic data

Marker Notes:

- *If student makes an error in any one part and is consistent with his/her error - only penalize once.*

Student exemplar 1



Two Ferris wheels are located at a carnival. The first rotates according to the model $y = 10\sin(0.105x - 1.571) + 11$ and the second rotates according to the model $y = 4\sin(0.262x - 1.571) + 5$ (where x is measured in seconds and y is measured in metres).

Total: 5 marks

a) What is the maximum height attained by the first Ferris wheel?

(1 mark)

10.73 m

b) How long does it take the second Ferris wheel to complete one full revolution? Show how you arrived at your answer.

(2 marks)

$P = \frac{2\pi}{.262}$

~~5.984 seconds~~

23.98 seconds

c) Each ride costs $3.00 and lasts approximately 5 minutes. Compare the two rides to determine which you would rather take. Use periodic data to support your choice.

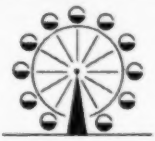
(2 marks)

I would much rather take the first ride as it travels much higher than the second one.

3 marks:

- No marks for incorrect answer in a)
- 2 marks for correct strategy and answer in b)
- 1 mark for correct comparison in c) without support

Student exemplar 2



Two Ferris wheels are located at a carnival. The first rotates according to the model $y = 10\sin(0.105x - 1.571) + 11$ and the second rotates according to the model $y = 4\sin(0.262x - 1.571) + 5$ (where x is measured in seconds and y is measured in metres).

Total: 5 marks

a) What is the maximum height attained by the first Ferris wheel?

(1 mark)

Max height = 21

b) How long does it take the second Ferris wheel to complete one full revolution? Show how you arrived at your answer.

(2 marks)

Period = $\frac{2\pi}{b}$ $b = 0.262$

Period = $\frac{2\pi}{.262}$ 23.98

the period - 23.98

c) Each ride costs $3.00 and lasts approximately 5 minutes. Compare the two rides to determine which you would rather take. Use periodic data to support your choice.

(2 marks)

height	21	9.2
Revolutions	5.01	12.5

I would take number one because it goes a lot higher than number 2 by 12

5 marks:
- Complete and correct

Specific Outcomes: H1 **Item Type: Restricted Response**

Question No. 22 and Answer

Total: 3 marks

A study revealed that in January 2001, 5000 people in a town used the Internet. Each year, this number is influenced by the following:

- **the number of Internet users is increased by 25%**
- **100 people cancel their Internet service.**

Determine the number of people that will use the Internet in this town by January 2006. Show how you arrived at your answer.

Now	5000
Year 1	6250 – 100 = 6150
Year 2	7688 – 100 = 7588
Year 3	9484 – 100 = 9384
Year 4	11 730 – 100 = 11 630
Year 5	14 638 – 100 = 14 438

If 100 taken off after increase of 25%.

OR

Now	5000
Year 1	(5000 – 100) (1.25) = 6125
Year 2	(6125 – 100) (1.25) = 7531
Year 3	(7531 – 100) (1.25) = 9289
Year 4	(9289 – 100) (1.25) = 11 486
Year 5	(11 486 – 100) (1.25) = 14 233

If 100 taken first and then increase of 25%.

You can use the sequencing mode of a graphing calculator to arrive at the answer.

OR

Year	Number of people		Number of people
1	5000		5000
2	6150		6125
3	7587.5	**OR**	7531.25
4	9384.38		9289.06
5	11 630.47		11 486.33
6	14 438		14 233

OR

Sequence mode
nMin = 0
u (n) = (u (n – 1) • 1.25) – 100
u (nMin) = {5000}

OR

nMin = 0
u (n) = (u (n – 1) – 100) • 1.25
u (nMin) = {5000}

Marker Notes:

- *Award 1 mark if students calculate only one year correctly.*

Marking Key
1 mark for correctly increasing the number of people by 25% each year
1 mark for correctly subtracting 100 people each year
1 mark for the correct final answer

Specific Outcomes: H2, H3 **Item Type: Restricted Response with Explanation**

Question No. 23 and Answer

Total: 3 marks

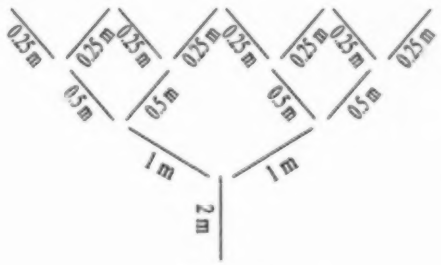
In an animated movie, Armand planted a tree. At the end of the first year, one branch grew and was 2 meters long. In the second year, two branches that were each 1 meter long grew from the first branch. In the third year, four 0.5-meter branches grew, two from each of the previous year's branches.

a) Continue the pattern to determine how many branches it will grow in the 4th year. Show how you arrived at your answer.

(2 marks)

number of branches: 1 branch
2 branches
4 branches
8 branches

OR



8 branches

b) What will be the length of each branch from the 4th year?

(1 mark)

0.25 m

Marking Key
1 mark for work shown indicating an appropriate strategy in a)
1 mark for the correct answer in a)
1 mark for the correct answer in b)

Marking Keys and Scoring Rubrics for the Inquiry Task

Inquiry Task Question No. 1 and Answer

PERSONAL FINANCE

Total: 10 marks

Ralph is graduating from high school. Since he will now be working full time, he calculates that he will be able to have $2000 saved by the end of the summer. He plans to use this money toward the purchase of a car that costs $10 000 including taxes. He recognizes that he must consider car insurance costs. He is considering two options for paying his insurance premiums:

Option A: **One time per year: $1181 payment**

Option B: **Quarterly (four times per year): First payment of $325, then three payments of $294**

Regardless of his choice, the amount of his first insurance payment must be paid from his $2000 savings. He will use the remaining savings as a down payment for the car.

Ralph can borrow the rest of the money for his car from his bank at an annual rate of 8.25% compounded monthly, over 36 months.

Compare Ralph's options in the following way:

a) **Calculate the amount available for the down payment towards the car purchase:**

(2 marks)

Option A $819 **Option B** $1675

b) **Calculate the amount of the monthly payment towards the car purchase:**

(3 marks)

Option A $288.76 **Option B** $261.84

TVM solver values:

Option A:		Option B:	
N =	36	N =	36
I% =	8.25	I% =	8.25
PV =	9181	PV =	8325
PMT =	–288.76	PMT =	–261.84
FV =	0	FV =	0
P/Y =	12	P/Y =	12
C/Y =	12	C/Y =	12
PMT =	END	PMT =	END

(or create your spreadsheets such as the model to follow)

Amount borrowed	Interest rate	Number of payments	Payment

c) **Calculate the total cost of the car at the end of three years including the down payment, the cost of paying off the loan and the cost of the car insurance premiums.**

(3 marks)

Option A: $2000 + (288.76 \times 36) + (1181 \times 2) = \$14\,757.36$

Option B: $2000 + (261.84 \times 36) + (294 \times 9) + (325 \times 2) = \$14\,722.24$

d) How much money must Ralph put aside monthly to ensure he has enough money available for his insurance payments? Show that your plan would work for both options.

(2 marks)

He needs at most $1207/year to cover insurance. That means Ralph should set aside $101/month.

OR

$\frac{1181.00}{12} = 98.42$ $\frac{1207}{12} = 100.58$

Ralph needs to budget $101 per month for insurance.

Marker Notes:

- *If students make same calculation error on both options - deduct only 1 mark.*
- *If student incorrectly calculates the down payment in a) to be $793 for Option 2, then in b) the monthly payment should be $289.58*

Marking Key
1 mark for each down payment in a) for a total of 2 marks
1 mark for work shown indicating an appropriate strategy in b)
1 mark for each payment amount in b) for a total of 2 marks
1 mark for correct down payment in c)
1 mark for correct cost of paying off the loan in c)
1 mark for correct car insurance in c)
1 mark for a reasonable recommendation in d)
1 mark for correct support in d)

Student exemplar 1

Total: 10 marks

Ralph is graduating from high school. Since he will now be working full time, he calculates that he will be able to have $2000 saved by the end of the summer. He plans to use this money toward the purchase of a car that costs $10 000 including taxes. He recognizes that he must consider car insurance costs. He is considering two options for paying his insurance premiums:

Option A: One time per year: $1181 payment

Option B: Quarterly (four times per year): First payment of $325, then three payments of $294

Regardless of his choice, the amount of his first insurance payment must be paid from his $2000 savings. He will use the remaining savings as a down payment for the car.

Ralph can borrow the rest of the money for his car from his bank at an annual rate of 8.25% compounded monthly, over 36 months.

Compare Ralph's options in the following way:

a) Calculate the amount available for the down payment towards the car purchase: *(2 marks)*

Option A $ 819.00 Option B $793.00

b) Calculate the amount of the monthly payment towards the car purchase: *(3 marks)*

Option A _____ Option B _____

TVM solver values:

Option A:		Option B:	
N =	36	N =	36
I% =	8.25	I% =	8.25
PV =	819.00	PV =	793.00
PMT =	[illegible] 271.53	PMT =	[illegible] 270.71
FV =	10000	FV =	10000
P/Y =	12	P/Y =	12
C/Y =	12	C/Y =	12
PMT =	END	PMT =	END

(or print your spreadsheets)

c) Calculate the total cost of the car at the end of three years including the down payment, the cost of paying off the loan and the cost of the car insurance premiums.

(3 marks)

Option A _____ Option B _____

d) How much money must Ralph put aside monthly to ensure he has enough money available for his insurance payments? Show that your plan would work for both options.

(2 marks)

2 marks:
- 1 mark for a) Option A
- 1 mark for strategy in b)

Student exemplar 2

Total: 10 marks

Ralph is graduating from high school. Since he will now be working full time, he calculates that he will be able to have $2000 saved by the end of the summer. He plans to use this money toward the purchase of a car that costs $10 000 including taxes. He recognizes that he must consider car insurance costs. He is considering two options for paying his insurance premiums:

Option A: One time per year: $1181 payment

Option B: Quarterly (four times per year): First payment of $325, then three payments of $294

Regardless of his choice, the amount of his first insurance payment must be paid from his $2000 savings. He will use the remaining savings as a down payment for the car.

Ralph can borrow the rest of the money for his car from his bank at an annual rate of 8.25% compounded monthly, over 36 months.

Compare Ralph's options in the following way:

a) Calculate the amount available for the down payment towards the car purchase: *(2 marks)*

Option A $819.00 Option B $1675.00

b) Calculate the amount of the monthly payment towards the car purchase: *(3 marks)*

Option A $288.76 Option B $261.84

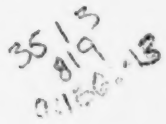
TVM solver values:

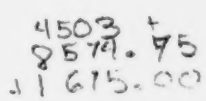
Option A:		Option B:	
N =	36	N =	36
I% =	8.25	I% =	8.25
PV =	-9181	PV =	-8325
PMT =	$288.76	PMT =	$261.84
FV =	0	FV =	0
P/Y =	12	P/Y =	12
C/Y =	12	C/Y =	12
PMT =	END	PMT =	END

(or print your spreadsheets)

c) Calculate the total cost of the car at the end of three years including the down payment, the cost of paying off the loan and the cost of the car insurance premiums.

(3 marks)





Option A $13788.43 Option B $14752.75

d) How much money must Ralph put aside monthly to ensure he has enough money available for his insurance payments? Show that your plan would work for both options.

(2 marks)

Option 1

Option 2 2000 - 1181 = $819

2000 - 325+(3x294)

=$793.00

Either way he will have enough money for the insurance

5 marks:

- 2 marks for a) - complete and correct
- 3 marks for b) - complete and correct
- 0 marks for c) - incorrect strategy and answers
- 0 marks for d) - insufficient explanation

Student exemplar 3

Total: 10 marks

Ralph is graduating from high school. Since he will now be working full time, he calculates that he will be able to have $2000 saved by the end of the summer. He plans to use this money toward the purchase of a car that costs $10 000 including taxes. He recognizes that he must consider car insurance costs. He is considering two options for paying his insurance premiums:

Option A: One time per year: $1181 payment

Option B: Quarterly (four times per year): First payment of $325, then three payments of $294

Regardless of his choice, the amount of his first insurance payment must be paid from his $2000 savings. He will use the remaining savings as a down payment for the car.

Ralph can borrow the rest of the money for his car from his bank at an annual rate of 8.25% compounded monthly, over 36 months.

Compare Ralph's options in the following way:

a) *(2 marks)* Calculate the amount available for the down payment towards the car purchase:

Option A $819 Option B $793

b) *(3 marks)* Calculate the amount of the monthly payment towards the car purchase:

Option A 288.76 Option B 289.58

TVM solver values:

Option A:

N = 36
I% = 8.25
PV = -9181
PMT = 288.76
FV = 0
P/Y = 12
C/Y = 12
PMT = END

Option B:

N = 36
I% = 8.25
PV = -9207
PMT = 289.58
FV = 0
P/Y = 12
C/Y = 12
PMT = END

(or print your spreadsheets)

c) Calculate the total cost of the car at the end of three years including the down payment, the cost of paying off the loan and the cost of the car insurance premiums.

(3 marks)

Option A $12757.33 Option B $12838.77

d) How much money must Ralph put aside monthly to ensure he has enough money available for his insurance payments? Show that your plan would work for both options.

(2 marks)

Ralph needs a job. If he makes $400 a week before taxes, then he would have enough money to pay for either option.

4 marks:

- 1 mark for correct calculation of Option A in a)
- 3 marks for b) - consistent with error in a)
- 0 marks for c)
- 0 marks for d) - unreasonable recommendation with no support

Student exemplar 4

Total: 10 marks

Ralph is graduating from high school. Since he will now be working full time, he calculates that he will be able to have $2000 saved by the end of the summer. He plans to use this money toward the purchase of a car that costs $10 000 including taxes. He recognizes that he must consider car insurance costs. He is considering two options for paying his insurance premiums:

Option A: One time per year: $1181 payment

Option B: Quarterly (four times per year): First payment of $325, then three payments of $294

Regardless of his choice, the amount of his first insurance payment must be paid from his $2000 savings. He will use the remaining savings as a down payment for the car.

Ralph can borrow the rest of the money for his car from his bank at an annual rate of 8.25% compounded monthly, over 36 months.

Compare Ralph's options in the following way:

a) Calculate the amount available for the down payment towards the car purchase: *(2 marks)*

Option A = 2000 - 1181 = $819.00

Option B 3(294) + 325 = 1207; 2000 - 1207 = $793.00

b) Calculate the amount of the monthly payment towards the car purchase: *(3 marks)*

Option A $288.76

Option B $289.56

TVM solver values:

Option A:		Option B:	
N =	36	N =	36
I% =	8.25	I% =	8.25
PV =	-9181.00	PV =	-9207.00
PMT =	?	PMT =	?
FV =	0	FV =	0
P/Y =	12	P/Y =	12
C/Y =	12	C/Y =	12
PMT =	END	PMT =	END

(or print your spreadsheets)

c) Calculate the total cost of the car at the end of three years including the down payment, the cost of paying off the loan and the cost of the car insurance premiums.

(3 marks)

MP = 288.76 × 36
= $10,395.36
+ 2000.00
$12,395.36

MP = $289.56
× 36
$10424.16
+ 2000
$12424.16

Option A $12,395.36 Option B $12424.16

d) How much money must Ralph put aside monthly to ensure he has enough money available for his insurance payments? Show that your plan would work for both options.

(2 marks)

	Option A	Option B
Monthly expenses:		
insurance: $1181.00 ÷ 12 =	$98.41	$100.58
payments:	$288.76	$289.56
Total:	$387.17	$390.14

8 marks:
- 1 mark for a)
- 3 marks for b) based on error in a)
- 2 marks for c) insurance missing
- 2 marks for d)

Student exemplar 5

Total: 10 marks

Ralph is graduating from high school. Since he will now be working full time, he calculates that he will be able to have $2000 saved by the end of the summer. He plans to use this money toward the purchase of a car that costs $10 000 including taxes. He recognizes that he must consider car insurance costs. He is considering two options for paying his insurance premiums:

Option A: One time per year: $1181 payment

Option B: Quarterly (four times per year): First payment of $325, then three payments of $294

Regardless of his choice, the amount of his first insurance payment must be paid from his $2000 savings. He will use the remaining savings as a down payment for the car.

Ralph can borrow the rest of the money for his car from his bank at an annual rate of 8.25% compounded monthly, over 36 months.

Compare Ralph's options in the following way:

a) Calculate the amount available for the down payment towards the car purchase: *(2 marks)*

Option A $819 Option B $793

b) Calculate the amount of the monthly payment towards the car purchase: *(3 marks)*

Option A $288.76 Option B $289.58

TVM solver values:

Option A:		Option B:	
N =	36	N =	36
I% =	8.25	I% =	8.25
PV =	-9181	PV =	-9207
• PMT =	288.76	• PMT =	289.58
FV =	0	FV =	0
P/Y =	12	P/Y =	12
C/Y =	12	C/Y =	12
PMT =	END	PMT =	END

(or print your spreadsheets)

c) Calculate the total cost of the car at the end of three years including the down payment, the cost of paying off the loan and the cost of the car insurance premiums.

(3 marks)

(paying or loan): 288.76 × 36 = $10395.36

(insurance) = 1181 × 3 = $3543

- not including down payment:
  10395.36 + 3543 = $13938.36

Including down payment:
$13938.36 + 819 =

Option A $14757.36

289.58 × 36 = $10424.88

294(3) + 325 = 1207 × 3 = $3621

- not including down payment
  10424.88 + 3621 = $14045.88

Including down payment:
14045.88 + 793 =

Option B $14838.88

d) How much money must Ralph put aside monthly to ensure he has enough money available for his insurance payments? Show that your plan would work for both options.

(2 marks)

I'm assuming Ralph makes $1000 a month because he makes $2000 in 2 summer months. I'm also assuming he still lives with his parents & that he doesn't have to pay rent, for food or any bills of any sort except his car payments & insurance costs.

Income in a month = $1000

Option A

Monthly car payments = $288.76

Clothes = $150.00

Entertainment = $200.00
(concerts, magazines, movies, outings of any sort)

Savings = $200.00 (for insurance)

Left over (to spend or save) = $161.24

200.00 × 12 = $2400

Ralph will have more than enough saved.

Option B

Monthly car payment = $289.58

Clothes = $150

Entertainment = $200.00

Savings = $200.00

Left over (to spend or save) = $161.24

200 × 12 = 2400

he will have $400 saved every 2 months which is more than enough for his quarterly payments.

This plan works for both options.

9 marks:

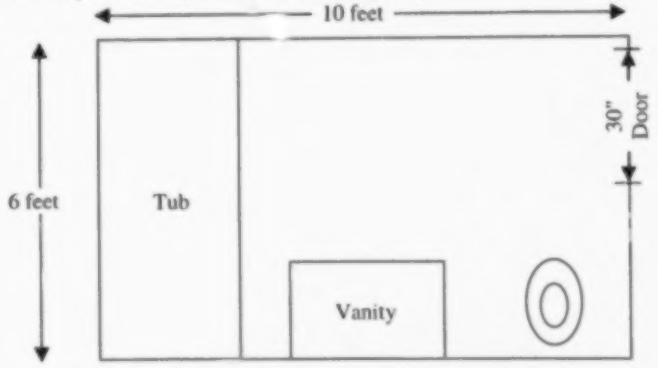
- 1 mark for a)
- 3 marks for b)
- 3 marks for c)
- 2 marks for budget in d)

Inquiry Task Question No. 2 and Answer

Total: 10 marks

You are planning to redecorate your bathroom (shown below). Your plans include painting the walls, recovering the floor and putting baseboards around the perimeter of the room.

Bathtub: 6 feet by 2 ½ feet, and 2 feet high
Sink vanity: 3 feet by 2 feet, and 36 inches high



a) **COST OF FLOOR COVERING: (show your calculations in the space provided)**
Vinyl flooring is sold in 6-foot widths. The area under the tub will not be covered and the flooring is to be installed in one piece. What length of flooring do you need to buy?

(1 mark)

$$10 - 2.5 = 7.5 \text{ feet}$$

b) **PAINT COSTS: (show your calculations in the space provided)**
The walls are 8 feet high and the dimensions of the door are 30 inches by 78 inches. The walls will require 2 coats of paint. The second coat will require $\frac{2}{3}$ as much paint as the first coat. The area behind the tub and the vanity do not need to be painted.

- **Calculate the area of the walls to be painted.**

A 4L can of paint covers 120 ft.^{2} at a cost of $42.99. A 1L can of paint covers 30 ft.^{2} at a cost of $14.99.

- **What combination of cans of paint do you need to buy in order to minimize the cost? What is your final cost? Show how you arrived at your answer.**

(5 marks)

Walls $10 \times 8 \times 2 = 160 \text{ ft.}^2$
$6 \times 8 \times 2 = 96 \text{ ft.}^2$
256 ft.^2

Area behind bathtub: $2 \times 2.5 \times 2 + 6 \times 2 = 22 \text{ ft.}^2$
Behind vanity: $3 \times 3 = 9 \text{ ft.}^2$
Door: $2.5 \times 6.5 = 16.25 \text{ ft.}^2$
47.25 ft.^2

Area to be painted = $256 \text{ ft.}^2 - 47.25 \text{ ft.}^2$
$= 208.75 \text{ ft.}^2$

With both coats = $208.75 \text{ ft.}^2 \times 1\frac{2}{3} = 347.92 \text{ ft.}^2$

$\frac{347.92}{30 \text{ ft.}^2} = 11.59\text{L or } 12\text{L}$ cheapest combination of cans = 3 - 4L cans $3 \times \$42.99 = \$128.97$

c) **BASEBOARD COSTS: (show your calculations in the space provided)**

The baseboards are sold in 8-foot lengths at a cost of $5.36 each. Determine the number of 8-foot baseboards needed and calculate the total cost of the baseboards. State any assumptions that you have made.

(2 marks)

Assumption: baseboards are around tub and vanity
6 ft. + 7.5 ft. + 7.5 ft. + 3.5 ft. + 4 ft. = 28.5 ft.
Cost: $28.5 \div 8 = 3.56 = 4 \times 5.36 = \$21.44$

OR

No baseboard in front of tub or vanity
$7.5 + 4.5 + 3.5 = 15.5 \div 8 = 2$ lengths
$2 \times 5.36 = 10.72 + 0.75 + 0.75 = \$12.22$

d) **BUDGET:**

You have a $300.00 budget for the entire bathroom project. How much money will you have left for the floor covering, after you have considered the paint, baseboards, GST and PST?

(2 marks)

Paint:	$128.97
Baseboards:	$21.44
Subtotal	$150.41
	× 1.14
	$171.47

Amount left for flooring = $300.00 – $171.47 = $128.53

Scoring Rubric

	Score and General Performance Indicators	Specific Performance Indicators/Criteria
Level 1 limited understanding	**1** **weak attempt, inappropriate strategy or no strategy**	- any combination of criteria for 1 mark
	2 **reasonable attempt, inappropriate strategy, major errors or omissions**	- any combination of criteria for 2 marks
	3 **reasonable attempt, inappropriate strategy but carried through correctly**	- any combination of criteria for 3 marks
Level 2 good understanding	**4** **sound strategy with major errors**	- any combination of criteria for 4 marks
	5 **sound strategy with minor errors**	- any combination of criteria for 5 marks
	6 **mostly complete with some omissions**	- any combination of criteria for 6 marks
	7 **close to complete and correct, major errors**	- any combination of criteria for 7 marks
Level 3 exceptional understanding	**8** **close to complete and correct, minor errors**	- any combination of criteria for 8 marks
	9 **almost complete and correct, trivial errors**	- any combination of criteria for 9 marks
	10 **complete and correct, reflecting exceptional understanding**	- any combination of criteria for 10 marks

Criteria:

1) 1 mark for correct length of vinyl flooring in a)

Part b):

2) 1 mark for work shown indicating an appropriate strategy for area of wall to be painted
3) 1 mark for correct answer for area of wall to be painted
4) 1 mark for correct amount of paint needed (area plus 2/3 area)
5) 1 mark for correct combination of cans of paint
6) 1 mark for correct cost of paint

Part c):

7) 1 mark for correct perimeter based on stated assumption(s)
8) 1 mark for cost of baseboard

Part d):

9) 1 mark for correct calculation of taxes
10) 1 mark for correct amount left over

Marker Notes:

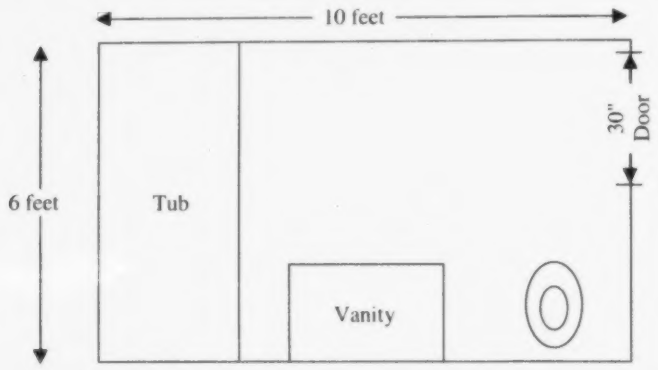
- *Other answers possible in c)*
- *Maximum ½ mark deduction for each kind of technical communication error (see page 2 of this guide)*

Student exemplar 1

Total: 10 marks

You are planning to redecorate your bathroom (shown below). Your plans include painting the walls, recovering the floor and putting baseboards around the perimeter of the room.

Bathtub: 6 feet by 2 ½ feet, and 2 feet high
Sink vanity: 3 feet by 2 feet, and 36 inches high



a) **COST OF FLOOR COVERING:** (show your calculations in the space provided)

Vinyl flooring is sold in 6-foot widths. The area under the tub will not be covered and the flooring is to be installed in one piece. What length of flooring do you need to buy?

(1 mark)

7.5

b) **PAINT COSTS:** (show your calculations in the space provided)

The walls are 8 feet high and the dimensions of the door are 30 inches by 78 inches. The walls will require 2 coats of paint. The second coat will require $\frac{2}{3}$ as much paint as the first coat. The area behind the tub and the vanity do not need to be painted.

- Calculate the area of the walls to be painted.

$8 \times (10 + 5.5 + 10 + 6) = 252 \text{ ft}^2$

$252 \times \frac{2}{3} = 168 \text{ ft}^2$

$252 + 168 = 420 \text{ ft}^2$

A 4L can of paint covers 120 ft.^{2} at a cost of \$42.99. A 1L can of paint covers 30 ft.^{2} at a cost of \$14.99.

- What combination of cans of paint do you need to buy in order to minimize the cost? What is your final cost? Show how you arrived at your answer.

(5 marks)

$4 \times 4L \Rightarrow 4 \times 42.99 = \$171.96$

OR $3 \times 4L + 2 \times 1L \Rightarrow 3 \times 42.99 + 2 \times 14.99$

$= \$158.95$

$\therefore$ use 3 4L + 2 1L.

c) **BASEBOARD COSTS:** (show your calculations in the space provided)

The baseboards are sold in 8-foot lengths at a cost of $5.36 each. Determine the number of 8-foot baseboards needed and calculate the total cost of the baseboards. State any assumptions that you have made.

(2 marks)

10 + 5.5 + 10 + 6 = 31.5 ft

baseboards not at door

d) **BUDGET:**

You have a $300.00 budget for the entire bathroom project. How much money will you have left for the floor covering, after you have considered the paint, baseboards, GST and PST?

(2 marks)

31.5 x 5.36 = $168.84

158.95 + 168.84 = $327.79

over budget!

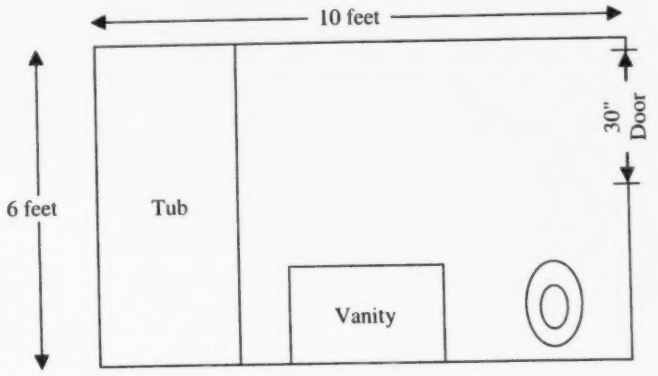
4 marks:
- Criteria 1, 2, 4 and 6 met

Student exemplar 2

Total: 10 marks

You are planning to redecorate your bathroom (shown below). Your plans include painting the walls, recovering the floor and putting baseboards around the perimeter of the room.

Bathtub: 6 feet by 2 ½ feet, and 2 feet high
Sink vanity: 3 feet by 2 feet, and 36 inches high



a) **COST OF FLOOR COVERING:** (show your calculations in the space provided)

Vinyl flooring is sold in 6-foot widths. The area under the tub will not be covered and the flooring is to be installed in one piece. What length of flooring do you need to buy?

(1 mark)

6' = 72" 10' - tub width

10' - 2' = 8'

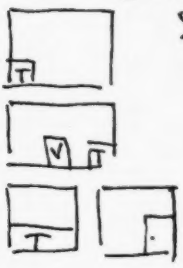
or

8 x 12 = 96 inches long.

b) **PAINT COSTS:** (show your calculations in the space provided)

The walls are 8 feet high and the dimensions of the door are 30 inches by 78 inches. The walls will require 2 coats of paint. The second coat will require $\frac{2}{3}$ as much paint as the first coat. The area behind the tub and the vanity do not need to be painted.

- Calculate the area of the walls to be painted.



I assumed that I'm supposed to paint the door to

8 x 12 = 96

~~96~~ X

8 x ~~5~~ 10 = 80
8 x 10 = 80
6 x 8 = 48
6 x 8 = 48

256 x 12 = 3072 inches = 256 feet

A 4L can of paint covers 120 ft.^{2} at a cost of $42.99. A 1L can of paint covers 30 ft.^{2} at a cost of $14.99.

- What combination of cans of paint do you need to buy in order to minimize the cost? What is your final cost? Show how you arrived at your answer.

(5 marks)

30 feet is 14.99
120 feet is 42.99

256 − 120 (42.99)
136 − 120 (42.99)
16 (14.99)

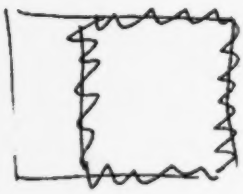
$100.97 plus tax = $115.11
x1.14

c) **BASEBOARD COSTS:** (show your calculations in the space provided)

The baseboards are sold in 8-foot lengths at a cost of $5.36 each. Determine the number of 8-foot baseboards needed and calculate the total cost of the baseboards. State any assumptions that you have made.

(2 marks)

I assumed that all the baseboards on the floor.



10 - 2 = 8
10 - 2 = 8
6 = 6
6 (subtract door) = 3.5
25.5 x 5.36

You need 4 boards
is 4 x 5.36
= 21.44
plus tax 24.44

d) **BUDGET:**

You have a $300.00 budget for the entire bathroom project. How much money will you have left for the floor covering, after you have considered the paint, baseboards, GST and PST?

(2 marks)

none.

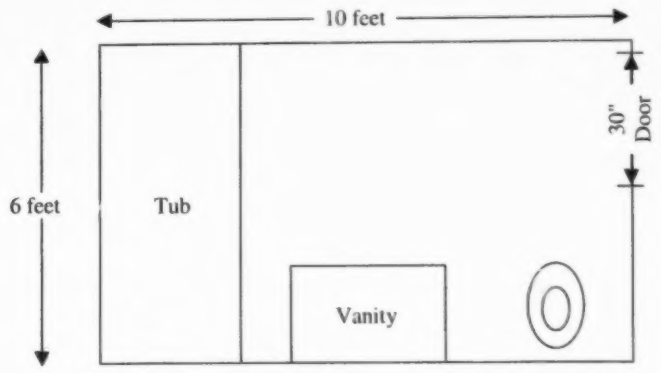
5 marks:
- Criteria 2, 5, 6, 7 and 8 met

Student exemplar 3

Total: 10 marks

You are planning to redecorate your bathroom (shown below). Your plans include painting the walls, recovering the floor and putting baseboards around the perimeter of the room.

Bathtub: 6 feet by 2 ½ feet, and 2 feet high
Sink vanity: 3 feet by 2 feet, and 36 inches high



a) **COST OF FLOOR COVERING:** (show your calculations in the space provided)

Vinyl flooring is sold in 6-foot widths. The area under the tub will not be covered and the flooring is to be installed in one piece. What length of flooring do you need to buy?

(1 mark)

10 - 2.5 = 7.5 feet

b) **PAINT COSTS:** (show your calculations in the space provided)

The walls are 8 feet high and the dimensions of the door are 30 inches by 78 inches. The walls will require 2 coats of paint. The second coat will require $\frac{2}{3}$ as much paint as the first coat. The area behind the tub and the vanity do not need to be painted.

- Calculate the area of the walls to be painted.

$30 \times 78 = \frac{2340 \text{ sq in}}{144} = 16.25 \text{ sq ft}$

Not to be painted: Tub: $(8 \times 6) + (2.5 \times 8)2 = 88 \text{ sq ft} + 16.25$
$= 104.25 \text{ sq ft}$

$\therefore$ Paint: $(7.5 \times 8) + (3.5 \times 8) + (0.5 \times 8) + (4 \times 8)$
$= 96.8 \text{ sq ft}$.

A 4L can of paint covers 120 ft.^{2} at a cost of \$42.99. A 1L can of paint covers 30 ft.^{2} at a cost of \$14.99.

- What combination of cans of paint do you need to buy in order to minimize the cost? What is your final cost? Show how you arrived at your answer.

(5 marks)

Since 96.8 sq ft, 1 - 4L can \$42.99

OR 4 - 1L @ \$14.99 so \$59.96

$\therefore$ 1, 4L can.

c) **BASEBOARD COSTS:** (show your calculations in the space provided)

The baseboards are sold in 8-foot lengths at a cost of $5.36 each. Determine the number of 8-foot baseboards needed and calculate the total cost of the baseboards. State any assumptions that you have made.

(2 marks)

* I put baseboards around door, infront of tub, not around vanity

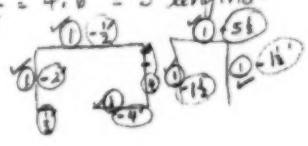
12 x 60
= 72 - 30
= 42/12 = 3.5 sq ft (door side)

30/12 = 2.5
78/12 = 6.5

Perimeter: $7\frac{1}{2} + 6 + \frac{1}{2} + 4 + 3.5 + 6.5 + 6.5 + 2.5 =$ 37.0

So $\frac{37}{8} = 4.6 =$ 5 lengths

but:



∴ I would really need 6 since I don't want to piece together on the top of door
∴ 6 x 5.36 = $32.16 for baseboards.

d) **BUDGET:**

You have a $300.00 budget for the entire bathroom project. How much money will you have left for the floor covering, after you have considered the paint, baseboards, GST and PST?

(2 marks)

d) So ($42.99 + 32.16) x 1.14 =
75.15 x 1.14 = $85.67

300 - 85.67 = $214.33 for flooring.

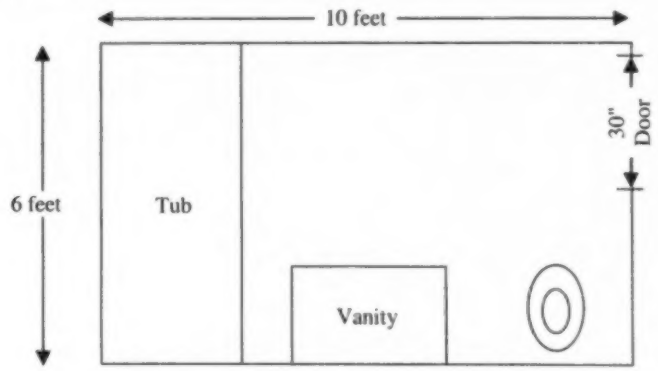
7 marks:
- Criteria 1, 2, 5, 6, 8, 9 and 10 met

Student exemplar 4

Total: 10 marks

You are planning to redecorate your bathroom (shown below). Your plans include painting the walls, recovering the floor and putting baseboards around the perimeter of the room.

Bathtub: 6 feet by 2 ½ feet, and 2 feet high
Sink vanity: 3 feet by 2 feet, and 36 inches high



a) **COST OF FLOOR COVERING:** (show your calculations in the space provided)

Vinyl flooring is sold in 6-foot widths. The area under the tub will not be covered and the flooring is to be installed in one piece. What length of flooring do you need to buy?

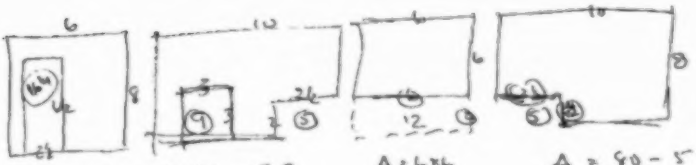
(1 mark)

7½ Feet.

b) **PAINT COSTS:** (show your calculations in the space provided)

The walls are 8 feet high and the dimensions of the door are 30 inches by 78 inches. The walls will require 2 coats of paint. The second coat will require $\frac{2}{3}$ as much paint as the first coat. The area behind the tub and the vanity do not need to be painted.

- Calculate the area of the walls to be painted.



A 4L can of paint covers 120 ft.^{2} at a cost of $42.99. A 1L can of paint covers 30 ft.^{2} at a cost of $14.99.

- What combination of cans of paint do you need to buy in order to minimize the cost? What is your final cost? Show how you arrived at your answer.

(5 marks)

PAINT REQUIRED = 208.75 × 1⅔ = 348.61

348.61/120 = 2.905 = 3 cans.

3 × 42.99 = 128.97 × 1.14

= $147.03

c) **BASEBOARD COSTS:** (show your calculations in the space provided)

The baseboards are sold in 8-foot lengths at a cost of $5.36 each. Determine the number of 8-foot baseboards needed and calculate the total cost of the baseboards. State any assumptions that you have made.

(2 marks)

$7\frac{1}{2} + 6 + 10 + 7\frac{1}{2} + 4 + 3\frac{1}{2} = 38\frac{1}{2}$ ~~38~~

↑ in front of two.

So 5 lengths

$5 \times 5.36 = 26.80$ x 1.14

$= 30.55$

d) **BUDGET:**

You have a $300.00 budget for the entire bathroom project. How much money will you have left for the floor covering, after you have considered the paint, baseboards, GST and PST?

(2 marks)

$300 - 147.03 - 30.55 = \$122.42$

9 marks:
- All but criterion 7 met

Appendices

APPENDIX A

Table of Specific Outcome Match and Item Type

Multiple-choice items				
Question #	Key	Unit	Specific Outcome	Mark
1	D	A	1	1
2	C	A	1	1
3	B	B	1	1
4	B	D	2	1
5	A	D	4	1
6	D	E	2	1
7	C	E	2	1
8	D	H	1	1
9	A	H	1	1

Restricted-response items			
Question #	Unit	Specific Outcome	Mark
12	B	3	4
14	D	1	2
15	D	3, 4	2
19	G	2	2
22	H	1	3

Restricted-response with explanation items			
Question #	Unit	Specific Outcome	Mark
11	A	2	3
16	D	5	3
18	E	3	4
20	G	2, 3	3
23	H	2, 3	3
Inquiry 1	C	1, 3	10

Open-response items			
Question #	Unit	Specific Outcome	Mark
10	A	1, 2	6
13	B	2, 3	6
17	E	1, 2	5
21	G (H)	1–3 (1)	5
Inquiry 2	F	1–4	10

APPENDIX B

Generating Student Profiles

Profile of Test Score by Question Type

Item Type	Test Items	Total	+ Maximum	× 100	= %
Multiple-choice	1 to 9: ____		9		
Restricted-response	12 ____, 14 ____, 15 ____, 19 ____, 22 ____		13		
Restricted-response with explanation	11 ____, 16 ____, 18 ____, 20 ____, 23 ____, Inquiry 1 ____,		26		
Open-response	10 ____, 13 ____, 17 ____, 21 ____, Inquiry 2 ____		32		

Profile of Test Score by Curriculum Unit

Unit	Test Items	Total	+ Maximum	× 100	= %
Matrices	1 ____, 2 ____, 10 ____, 11 ____		11		
Vectors	3 ____, 12 ____, 13 ____		11		
Personal Finance	Inquiry 1 ____		10		
Probability	4 ____, 5 ____, 14 ____, 15 ____, 16 ____,		9		
Variability and Statistics	6 ____, 7 ____, 17 ____, 18 ____		11		
Design and Measurement	Inquiry 2 ____		10		
Periodic Functions	19 ____, 20 ____, 21 ____		10		
Sequences	8 ____, 9 ____, 22 ____, 23 ____		8		

APPENDIX C—Sheets for marking the Inquiry Tasks

Inquiry Task 1: Personal Finance	Booklet Numbers									
• 1 mark for each down payment in a) for a total of 2 marks										
• 1 mark for work shown indicating an appropriate strategy in b)										
• 1 mark for each payment amount in b) for a total of 2 marks										
• 1 mark for correct down payment in c)										
• 1 mark for correct cost of paying off the loan in c)										
• 1 mark for correct car insurance in c)										
• 1 mark for reasonable recommendation in d)										
• 1 mark for correct support in d)										
Totals										

Inquiry Task 1: Personal Finance	Booklet Numbers									
• 1 mark for each down payment in a) for a total of 2 marks										
• 1 mark for work shown indicating an appropriate strategy in b)										
• 1 mark for each payment amount in b) for a total of 2 marks										
• 1 mark for correct down payment in c)										
• 1 mark for correct cost of paying off the loan in c)										
• 1 mark for correct car insurance in c)										
• 1 mark for reasonable recommendation in d)										
• 1 mark for correct support in d)										
Totals										

Use check marks (✓) to tally students' marks on the question

	Inquiry Task 2: Design and Measurement	Booklet Numbers								
	• 1 mark for correct length of vinyl flooring in a)									
Part b)	• 1 mark for work shown indicating an appropriate strategy for area of wall to be painted									
Part b)	• 1 mark for correct answer for area of wall to be painted									
Part b)	• 1 mark for correct amount of paint needed (area plus 2/3 area)									
Part b)	• 1 mark for correct combination of cans of paint									
Part b)	• 1 mark for correct cost of paint									
Part c)	• 1 mark for correct perimeter based on stated assumption(s)									
Part c)	• 1 mark for cost of baseboard									
Part d)	• 1 mark for correct calculation of taxes									
Part d)	• 1 mark for correct amount left over									
	Maximum ½ mark deduction for technical communication error(s) (see page 2 of this guide) **Totals**									

	Inquiry Task 2: Design and Measurement	Booklet Numbers								
	• 1 mark for correct length of vinyl flooring in a)									
Part b)	• 1 mark for work shown indicating an appropriate strategy for area of wall to be painted									
Part b)	• 1 mark for correct answer for area of wall to be painted									
Part b)	• 1 mark for correct amount of paint needed (area plus 2/3 area)									
Part b)	• 1 mark for correct combination of cans of paint									
Part b)	• 1 mark for correct cost of paint									
Part c)	• 1 mark for correct perimeter based on stated assumption(s)									
Part c)	• 1 mark for cost of baseboard									
Part d)	• 1 mark for correct calculation of taxes									
Part d)	• 1 mark for correct amount left over									
	Maximum ½ mark deduction for technical communication error(s) (see page 2 of this guide) **Totals**									

Use check marks (✓) to tally students' marks on the question